MODERN MECHANICS

AND INVENTIONS

Oct. 25¢

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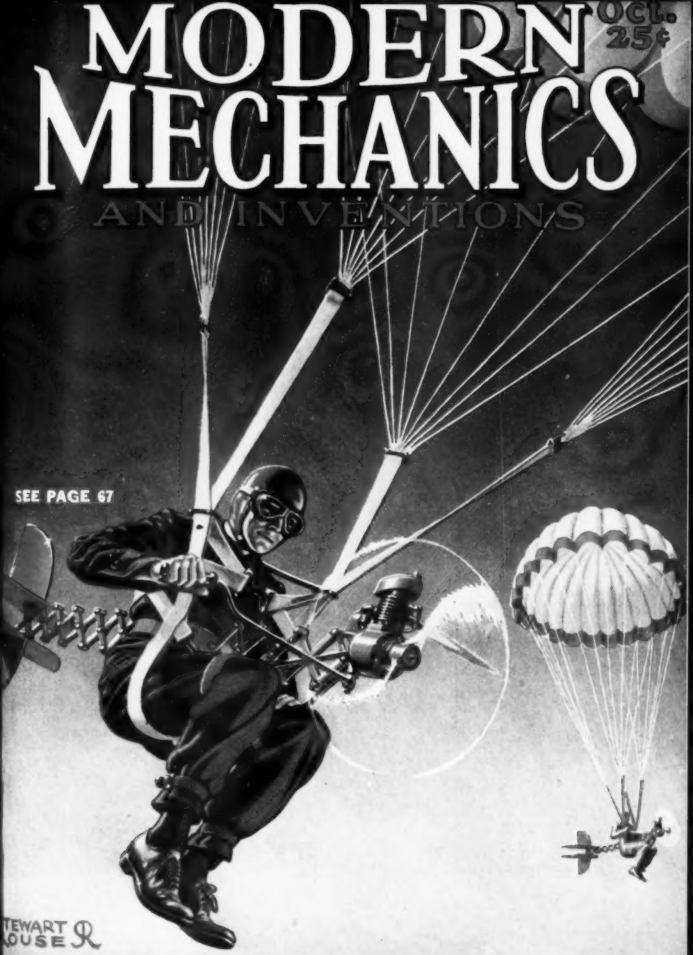

STEWART LOUSE

MOTORIZED PARACHUTES

Over the Mountains from Los Angeles 559 Miles on 11 Gallons of GAS

Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to the gallon and 25% in speed. We placed another on a Willys-Knight and increased from 12 to 17 miles per gallon."

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I have saved in gasoline these last few years has brought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED

Free Sample and $100.00 a Week Offer

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer and full particulars sent on request. Just check the coupon.

WHIRLWIND MANUFACTURING CO.
999—334-A, Third Street Milwaukee, Wis.

GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

FREE TRIAL COUPON

WHIRLWIND MANUFACTURING CO.,
999 334-A, Third Street, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and free trial offer. This does not obligate me in any way whatever.

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Address .....

City ..... State .....

County .....

☐ Check here if you are interested in full or part time salesmen position

LePage's Waterproof Glue

High Strength and Weather-Resisting

Now Offered in Convenient Packages for Home Use

LePage's Tested Hard Glue

If you prefer to use a hard glue, ask for LePage's Tested Hard Glue. Tested for uniform quality. No experimenting with each new lot to see how much water to add, or how long to cook.

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Always ready for immediate use. No bother of preparation. Easy to work with because it sets slowly enough to give you plenty of time to adjust joints. Makes lasting joints of tremendous strength.

You've seen cans of LePage's Liquid Glue wherever things are made. You've probably used it yourself. But do you realize that LePage's also makes a waterproof glue? Often you have need for it in making joints that must stand up, impervious to moisture, indoors or outdoors.

Glue makes all joints stronger even though you also use nails or screws. Any cabinetmaker will tell you that the quality of your finished work depends upon the strength and permanency of joints.

Whatever kind of glue you like or need to use, LePage's makes it—Liquid, hard or waterproof. Stronger than the fibers of the wood they join. Every batch tested to stand 3000 lbs. shearing strain per square inch.

Vol. IV — No. 6

A FAWCETT MAGAZINE

Other Fawcett magazines are Screen Play Secrets, Triple-X, Battle Stories, Startling Detective Adventures, True Confessions, Mystic Magazine and Hollywood.

MODERN MECHANICS AND INVENTIONS

October, 1930

PRICE 25 CENTS

This magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

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COMING IN NOVEMBER

An article on the opportunities held forth by the talkies for young men with technical training, telling of the shortage of trained sound engineers in this big new industry. The story of the world's largest private zoo. Regular departments for home craftsmen, radio fans, and electrical experimenters, and the usual fine brand of How-to-Build articles found only in Modern Mechanics. Don't miss the November issue, on sale everywhere October First!

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Edited by Experts

Listed here are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers concerning their departments. Address m in care of this magazine, Robbinsdale, Minnesota.

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Published monthly by Fawcett Publications, Inc., at 501 7th Ave. So., Minneapolis, Minnesota. MODERN MECHANICS AND INVENTIONS entered as second class matter September 20th, 1928, at the Post Office, Minneapolis, Minnesota, under the act of March 3rd, 1879. W. H. Fawcett, Publisher; Roscoe Fawcett, Managing Editor; Jack Smalley, Assistant Managing Editor. Copyright 1930. Ray Rust, Advertising Manager; Chicago office, 35 East Wacker Drive (Phone State 2955); New York office, 52 Vanderbilt Avenue, Room 606 (Phone Vanderbilt 8490). All manuscripts should be addressed to our editorial office at Robbinsdale, Minn. Manuscripts will not be returned unless accompanied by return postage. Advertising forms close on the 20th of the third preceding month. Price 25 cents a copy; $2.50 a year in the United States and possessions. Other Postal Unions, $3.00 per year. Printed in U. S. A.

...Raised His Pay $4800* After Reading This Amazing Book Which Is Now *FREE!*

*Based on the combined experiences of F. B. Englehardt, Chattanooga, Tenn., A. F. Thompson, Sioux City, Iowa, L. H. Lundstedt, Chicago, and many others.

Caught in a Rut

I wonder I put up with it as long as I did! Every day was filled with nothing but deadly routine and monotonous detail. No freedom or independence. No chance to get out and meet people, travel, have new interesting experiences. I was just like a cog in a big machine with poor prospects of ever being anything more.

Long, Tiresome Hours

Every hour of the day I was under somebody's supervision. The TIME-CLOCK constantly laid in wait for me—a monument to unfulfilled hopes and dying ambition. Four times a day, promptly on the dot, it hurled its silent challenge at my self-respect, reminding me how unimportant I was and how little I really COUNTED in the business and social world!

Low Pay

Paid just enough to keep going—but never enough to enjoy any of the GOOD things of life every man DESERVES for his family and himself. Always economizing and pinching pennies. Always wondering what I would do if I were laid off or lost my job. Always uncertain and apprehensive of the future.

Desperate

Happened to get a look at the payroll one day and was astonished to see what big salaries went to the sales force. Found that salesman Brown made $200 a week—and Jenkins $275! Would have given my right arm to make money that fast, but never dreamed I had any "gift" for salesmanship.

A Ray of Light

Stumbled across an article on salesmanship in a magazine that evening. Was surprised to discover that salesmen were made and not "born" as I had foolishly believed. Read about a former ranchman, Wm. Shore of California, making $525 in one week after learning the ins-and-outs of scientific salesmanship. Decided that if HE could do it, so could I!

The Turning Point

My first step was to write for a certain little book which a famous business genius has called "The MOST AMAZING BOOK EVER PRINTED". It wasn't a very *big* book, but it certainly opened My eyes to things I had never *dreamed of*—and proved the turning point of my entire career!

What I Discovered

Between the pages of this remarkable volume, I discovered hundreds of little known facts and secrets that revealed the REAL TRUTH about the science of selling! It wasn't a bit as I had imagined. I found out that it was governed by simple rules and laws that almost ANY man can master as easily as he learned the alphabet. I even learned how to go about getting into this "highest paid of all professions". I found out exactly how Mark Borchardt of San Francisco was enabled to quit his $8 a week job as a restaurant worker and start making $125 a week as a salesman; and how C. W. Birmingham of Dayton, Ohio, jumped from $15 a week to $7500 a year—these and *hundreds* of others! It certainly was a revelation!

FREE Employment Service

Furthermore, I discovered that the National Salesmen's Training Association, which published the book, also operates a most effective employment service! Last year they received requests from all over the U. S. and Canada for more than 50,000 salesmen trained by their method. This service is FREE to both members and employers and thousands have secured positions this way!

Making Good At Last!

It didn't take me long to decide to cast my lot with N. S. T. A.—and after a few weeks I had mastered the secrets of Modern Salesmanship during spare time, without losing a day or a dollar from my old job. When I was ready, the Employment Manager found me over a dozen good openings to choose from—and I selected one which paid me over $70 a week to start!

Was It Worth It?

Today my salary is $4800 greater than ever before! No more punching time-clocks or worrying over dimes and quarters! NOW my services are in REAL DEMAND with bigger prospects for the future than I ever dared HOPE for back in those days when I was just another "name" on a pay-roll!

Get Your Copy FREE

Right now the book—"The Key to Master Salesmanship" and other details of the N.S.T.A. service—which banishes all my fears and troubles and showed me how to get started on the road to success and independence—will be mailed as a gift to any ambitious man, absolutely **FREE.** And since there is no obligation, why not see for yourself what amazing facts it contains! Just mail the coupon now—for there is no better way to invest a 2-cent stamp! I KNOW!

National Salesmen's Training Assn., Dept. R-703 N. S. T. A. Bldg., Chicago, Ill.

Without obligation, please send me a free copy of "The Key to Master Salesmanship," and other details of N. S. T. A. service.

Name ..... Address .....

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RADIO WANTS MEN TRAINED AS R. T. I. TRAINS THEM AT HOME for PRACTICAL WORK

Radio wants trained men and pays them well. This great industry would rather pay Big Money to men trained as R. T. I. trains them than low wages to untrained "tinkers" and "guessers." Trained radio training and experience can easily make $40 to $50 per week and upwards. You need no experience to get into Radio right and the definite path to facts from leading radio men in the free "R. T. I. Radio Opportunity Book."

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Radio Mechanic and Inspector $1800 to $4000 a Year

The only course in Radio sponsored by RCA

LET THIS SHORT-CUT HELP YOU INTO

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Address.....

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Occupation.....

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NEW INDUSTRY NEEDS MEN

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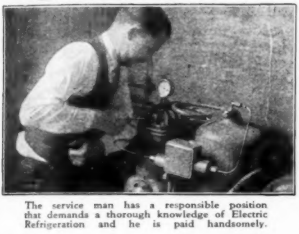


The service man has a responsible position that demands a thorough knowledge of Electric Refrigeration and he is paid handsomely.

Trained experts are highly paid for this clean, interesting and fascinating work. Plain, practical men are needed in every branch of the industry.

Fit Yourself At Home For

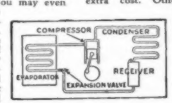
A BIG PAY JOB

Or Business Of Your Own

$50 to $125 A Week

HERE'S great news for every ambitious man who is tired of poor pay, unemployment, long hours, uninteresting work and no advancement! America's newest and fastest-growing industry—Electric Refrigeration—is calling for trained men to fill responsible positions being opened every day. Right now there is urgent need for plain, practical men qualified to install, service and repair electric refrigerators. Wonderful opportunities also in sales, engineering and manufacturing divisions. Clean, fascinating work that pays big because trained men are scarce. You will visit the better homes and merchants in your locality; drive a car with all expenses paid. You may even have your own business as the local service station for distant manufacturers. U. E. I. training, a few tools and some business cards are all you need!

Be the first in your locality to get into this magic new industry—while it is uncrowded and has plenty of room at the top! That's what General Motors, General Electric and other money powers did. They invested millions and now they need men like you with proper training. As a result, you have the chance of a lifetime to make your dreams of success come true!



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To meet the increasing need for trained experts, the Utilities Engineering Institute has developed a remarkable new training method that quickly teaches you the principles and practices of Electric Refrigeration . . . right at home in your spare time. This training highly praised and endorsed by Servel, Kelvinator, General Electric, Copeland, Zerozone and others. Many of their employees enrolled. Fits you quickly for a big pay job. Unique—entirely different! Unlike ordinary schooling. No textbooks or study drudgery. Simple fascinating lessons—chock full of charts, diagrams, practical problems—teach you everything you need to know. Experts guide you step by step. Free employment service for life to graduates. Two weeks' actual shop experience included without extra cost. Other extra features. Low tuition. Easy terms. Money-back agreement protects you. If you are serious about success, investigate AT ONCE!

UTILITIES ENGINEERING INSTITUTE
Dept. 6100, 4403 Sheridan Road
CHICAGO, ILL.

Here's Proof

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"Although I've had only 4 mos. U.E.I. training, I won promotion from night watchman to manager of refrigeration dept. when my employer learned I was receiving your training."

H.R.Collier, Tacoma, Wash.

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"A year ago I was a truck driver, earning little, getting nowhere. Now I am a U.E.I. grad and have a fine position servicing refrigerators. I have my own car, with expenses paid and an unlimited future."

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"I am only half through with my U.E.I. training but already I have been called on to make adjustments on refrigerators."

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Money Back If Not Satisfied

I train you under a positive Money-Back Agreement. If my training does not satisfy you after you have finished you get every penny back.

Earn While You Learn

You can start earning money a few weeks after beginning my training. I give you special work and tell you how to make money.

Money-Making Tools Furnished

You get these fine quality, genuine, imported draftsman's tools, just as soon as you become my student. No finer tools made for practical drafting work.

Employment Service

After training you I help you to get a job without charging you a cent for this service. Employers of draftsmen come to me for men because they know that men I train make good.

Draftsmen Needed In:

Auto Work
The automobile industry is one of the greatest in America. Thousands of draftsmen needed. I'll train you for the work.

Electricity
Electricity is the coming motive force of the world. Draftsmen are needed in every department of this fascinating work. I'll train you at home. Get a job here.

Aviation
Aviation is just in its infancy. It is bound to expand to enormous proportions. Draftsmen are essential to it. I'll train you quickly. Write for drafting position.

Motor Bus Work
Motor bus building and motor bus transportation have become leading world industries. Hundreds of draftsmen employed in this work. I'll place you the way.

Building Work
There will always be building. No structure can be erected without plans drawn by draftsmen. I'll make you an architectural draftsman.

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1951 Lawrence Av., Chicago

"FREE" Pay-Raising Plan

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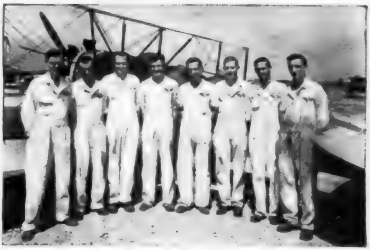

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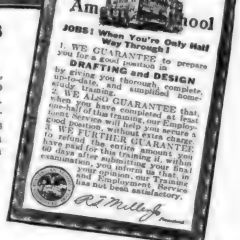

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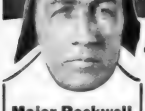

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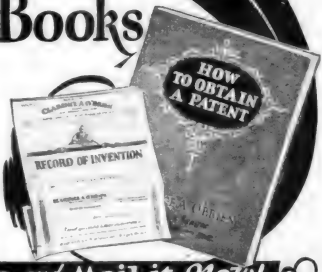

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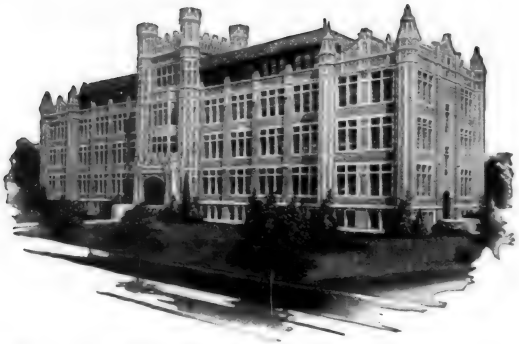

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Only one thing, then, for you to do—so important that it may prove the very turning point in your career: *you can and should compel those opportunities that quickly lead to bigger income, real success!*

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Assistant Superintendent Made Production Manager

Out on the Pacific coast lived a factory man, 30 years of age—assistant superintendent of a growing plant. He enrolled for home-study training in Modern Foremanship and shortly after got together an informal class of factory executives, for discussion and study. His general manager stepped him up to production manager with a salary-increase of 125 per cent.

Becomes Sales Manager

In a middle western city lived a salesman, 50 years of age. For 35 years he had sold—and sold successfully. Indeed, on nearly every sales force he had been at or near the top of the list in point of sales—*but he had never been able to sell himself as a sales manager or executive.* He was earning between five and six thousand dollars a year.

Within 18 months after his enrollment in Modern Salesmanship, he stepped into the position of president and general sales manager—at a salary of $15,000 a year.

Salary Increased 500%

A railroad clerk in New Jersey decided—like Jack London before him—that the only way out of a pit was *up!*

Training in Traffic Management led to a better job—then further training in Business Management helped him make good as sales manager—with a resultant salary 500 per cent larger than when he started training. Now he operates his own successful manufacturing concern.

These Cases Not Exceptional

And so we could go on, with case after case—yes, thousands of them—and every man could tell of a salary-increase better than 100 per cent which he directly credits to LaSalle training—

Are you, then, so different from these thousands of other men? *Have you less ambition? Do you lack the will power or the stamina to "see it through"?*

Send for Free Book

Below there's a coupon—just such a coupon as thousands of men used in their successful start toward greater earning power.

This coupon, filled in, clipped and mailed, will bring you an interesting booklet descriptive of LaSalle training in the field of your choice, together with a copy of that most inspiring book, "Ten Years' Promotion in One."

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NOW Van himself reveals the sensational truth! Countless housewives have learned that they can make big savings on our amazing bargain offers. So in almost no time the sale of our products has expanded almost to the "bursting" point. Now we must hurry and employ 1100 more local men and women to take care of new and regular customers in each town. Time must not be wasted! Orders must be filled quick! Customers must not be kept waiting! Big money for our representatives means nothing to us from now on! To save time I now offer every honest man and woman steady work and will pay cash for just a few hours of their time. You don't need to sell anything to get this cash payment. Just say 20 magic words to 10 ladies — 20 secret words that have proven almost magical money-getters for over 25,000 of my "pardners." I am so sure you can make quick money that I pay you an actual cash penalty if your first 10 calls do not give you a good profit. I give you a handsome profit on every order my customers give you. So what is to stop you from making as high as $35.00 in a day like some of my other "pardners?" I don't let you risk one penny. To show you that I do big things in a big way, I will send you $18.00 (retail value) worth of my products right out of stock to start you. Don't send a cent for this daring offer—just rush coupon. Maybe you think this is just ordinary work. But don't be mistaken. If you treat me fairly, I'll set you up in a business of your own. I'll tell you a priceless secret that will get others to make money for you. Right now I promise to help you toward ending your money worries forever, and I am known to 25,000 "pardners" as the man who always keeps his promises. If $15 in a day will end your money worries then mail the application below right now for this astonishing cash offer. Start in spare time if you wish. If you are a married woman, you can surely devote a few spare hours a day. My plan is a funny one.

I Send You $18.00 Worth of Goods (Retail Value)
To Start You Without Risk to You

$25,000.00 Bond Backs our Products

Some of my women "pardners" have actually made more money in a single day than their husbands make.

Rush Pay Application
Send No Money

I need 1100 more "pardners" quick to start on my daring new Cash Pay plan. This announcement will probably "upset" the nation. Untold thousands will apply for these openings. If you delay, it may be too late. Right now—mail the Application below for this daring Cash Penalty plan, offer of $18.00 worth of my goods (retail value) and the 20 secret words that may mean a fortune to you. Send no money. Just application. This application is not an order. You do not pay anything in this offer. Nothing will be sent C. O. D. Curtis W. Van De Mark, President, The Health-O Quality Products Co., Dept. 2034-KK, Health-O Bldg., Cincinnati, Ohio

Curtis W. Van De Mark, President,
The Health-O Quality Products Co.,
Dept. 2034-KK, Health-O Bldg., Cincinnati, Ohio.

Dear Van: I hereby apply for opening as "pardner" in my town to start on your new cash penalty agreement. Send offer of $18.00 worth of products (retail value) and written guarantee. Also tell me how I can make money saying 20 magic words to ladies. **This is not an order—send nothing C.O.D. I risk nothing.**

I want $.....per hour.

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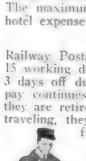
Railway Postal Clerks now get $1900 the first year, being paid on the first and fifteenth of each month, $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year, $112.50 each pay day. They get extra allowance for hotel expenses when away from home.

PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). When on runs they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country. They are furnished with a railroad pass for official business.



City Mail Carriers—Post Office Clerks

Clerks and Carriers get $1700 the first year regular and automatically increase $100 a year to $2100 with further increase to $2300. They also have 15 days vacation. City residence is unnecessary.

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- ☐ **Post Office Clerk...($1700-$2300)**
- ☐ **City Mail Carrier...($1700-$2100)**
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- ☐ **Clerk in Gov't Offices...($1200-$2500)**
- ☐ **Inspector of Customs.....($2100 up)**
- ☐ **Prohibition Agent.....($2300-$2800)**

Name.....

Address.....

Use This Coupon Before You Mislay It—Write or Print Plainly

Philip J. Dentinger, Buffalo, N. Y., owns this remarkably complete home workshop. It contains 500 tools and is worth at least one thousand dollars. This represents less than a dollar-a-week expenditure, as it took twenty years to collect. The shop has all popular motorized tools such as bandsaws, circular saw, grinder, sander, etc.

Andy's Shop Mail Box

DO YOU know what a Salve Agent is? I'll tell you. Here's a good one that taught me what this new tribe of engineer does for a living:

It seems that an old lady across the way heard two linemen, working on a pole near her second story window, using profane and blasphemous language. Knowing the tribe myself, I am inclined to think that that is putting it mildly. No doubt they were orally ripping daylight out of each other, if not actually separating their ideas from each other's physical defects.

The old lady was perturbed, and wrote a letter to the main office of the power company. The letter was answered by a courteous note, saying that the manager had had the two offenders on the carpet, and that their version of the affair was this: one of them, up on the pole, had spilled a ladle full of molten solder down the neck of the other, standing below, and that the latter had remonstrated, "Now Horace, you really must be more careful!"

The man who wrote that letter is a Salve Agent.

* * *

What do you think of Dentinger's workshop pictured above, gang? It'd be a pretty sweet place to while away the hours making model locos, or radio sets, or airplanes, wouldn't it? Or model boats, or engines—guess I'll quit before I start weeping from wishing.

I am glad for ye, though, Phil. Which mention calls to mind a letter from Mercer B. Barefield, Hollandale, Miss., who built a *Sez You*. He says in part:

> **I am enclosing pictures of the Sez boat I have just completed. She is certainly a clean little craft, fairly handled is a safe and speedy little wonder. She is doing approx. 30 m.p.h. with a Johnson 8 and weighs 170 pounds . . .**

Little old *Sez You* certainly hit the bull's-eye for simplicity, popularity, and go-ability. Thanks, suh, for the note.

Here is the little Sez You hull built by Mercer Barefield, M-M reader of Hollandale, Mississippi. She does 30 miles an hour with 8 horsepower.

(Continued on page 28)

"Stop clowning!"

. . . . HE WHISPERED

—but when I began to play

I HAD been trying—unsuccessfully—to make an impression on Helen for weeks. But she didn't seem to see me at all. Naturally, I was pretty downhearted at the turn affairs had taken. For, at the beginning of our acquaintance, she had certainly been far more friendly with me than now. Utterly perplexed, I turned to her brother for advice.

"Forget it," he laughed. "Helen isn't annoyed by anything you've done. It's something you haven't done. . . .Oh, I say, I'm sorry!" he broke off suddenly, red as a beet.

"What were you going to say?" I demanded. "What haven't I done?"

"It's nothing. Just a slip of the tongue," he evaded clumsily. But I insisted that he tell me and at last he consented.

"Well, you know, Helen has always been fond of music. I once heard her say she could never care for anyone who didn't know how to play some instrument or other. Of course, that's ridiculous. Lots of perfectly nice people — congenial, charming — have no musical ability. But you know how girls are. Once they get a notion, they stick to it, come what may!"

I almost broke out into three cheers at Jerry's explanation. But that would have spoiled my secret—the secret I had kept so well all these months. Instead, I said,

"I wish you had told me this before. For I can play a bit, you know—one-finger stuff."

He laughed, "Why not try it at the party to-night? It ought to show her your heart's in the right place, anyway!"

A Dramatic Surprise

That night I sat down at the piano and did a chop stick version of "Yes, We Have No Bananas!" to everybody's intense delight.

Calls of "What technique!" "When are you going to give a Carnegie Hall recital?" came from all over the room. But suddenly Jerry was at my side.

"Stop clowning!" he whispered. "Helen thinks I put you up to this to make fun of her!"

Instead of jumping up and apologizing to Helen, as he expected me to, I calmly swung into the opening bars of that beautiful ballad, "Garden in the Rain."

At first, astonishment kept them silent, but before long the whole crowd was singing—even Helen.

It must have been an hour before they allowed me to leave the piano. During that time I had played everything they asked for—songs, dance music, classical selections, jazz. . . .

My Secret

"Why on earth didn't you tell me you knew how to play?" demanded Jerry as we went home. "Why have you been keeping it a secret? I distinctly remember you once said you couldn't play. Yet tonight . . ."

I looked at Helen. "There was a special reason for playing tonight," I said. "I couldn't have done it months ago. Even last year Jerry's remark about my not being able to play, wouldn't have been an exaggeration.

"You see," I continued, "I discovered a method of learning music by mail, in one's spare time, at home, without a teacher."

Then I told them all about the U. S. School course. How it does away with tiresome scales and exercises—eliminates expensive private teachers.

"Why, I played simple tunes and melodies right from the start!" I enthused. "But I didn't want to tell you folks until I was sure I could play well enough to put it over. Besides, I didn't know Helen was so crazy about music. . . ."

"Not only about music," she murmured, with a shy smile.

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This is not the story of one isolated case. Over half a million men and women have learned to play their favorite instruments the U. S. School way.

To prove how practical this course is, we will be glad to send you a typical demonstration lesson and explanatory booklet, *without charge*. They show how *anyone* can learn to play *by note* in less than half the time and at a fraction of the cost of old, slow methods. The booklet will also tell you all about the amazing new *Automatic Finger Control*.

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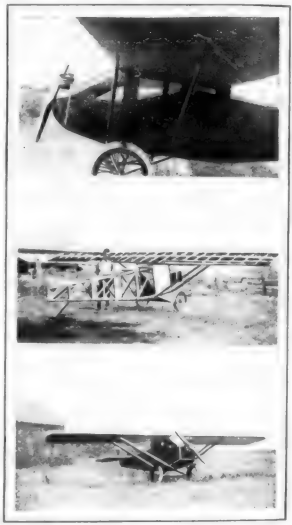
ALLIED RADIO CORPORATION
711 W. Lake Street Dept. 160, Chicago

Andy Gets Pix of an Alco

(Continued from page 26)

THIS humble slinger of mechanically saturated ink always gets a big bang out of seeing shots of planes home-built to our plans. James C. Hostetter, Jerseyville, Ill., built a mighty neat Alco Sport from plans in the FLYING MANUAL.



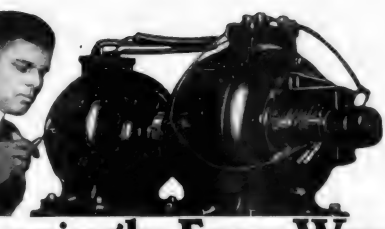
James C. Hostetter, of Jerseyville, Illinois, sends us these snapshots of his Alco Sportplane, built from our plans in the 1930 Flying Manual.

EXCERPTS from Jimmie's letter are very enlightening to the army of lightplane and glider enthusiasts:

Dear Sir:

I suppose a little explanation of myself and my plane is in order. For the past four years I have been an instructor in the manual training department of the Alton High School. The little plane is a combination of the Heath Parasol and other light planes

(Continued on page 36)



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Learn Without Lessons in 90 DAYS

By Actual Work — in the Great Shops of Coyne

Lack of experience—age, or advanced education bars no one. I don't care if you don't know an armature from an air brake—I don't expect you to! I don't care if you're 16 years old or 48—it makes no difference! Don't let lack of money stop you. Most of the men at Coyne have no more money than you have.

Railroad Fare Allowed

I will allow your railroad fare to Chicago, and if you should need part-time work I'll assist you to it. Then, in 12 brief weeks in the great roaring shops of Coyne, I train you as you never dreamed you could be trained . . . on a gigantic outlay of electrical apparatus . . . costing hundreds of thousands of dollars . . . real dynamos, engines, power plants, autos, switchboards, transmitting stations . . . everything from doorbells to farm power and lighting . . . full-sized . . . in full operation every day!

Prepare for Jobs Like These

Here are a few of hundreds of positions open to Coyne-trained men. Our free employment bureau gives you lifetime employment service.

Armature Winder	$75 to $100 a Week
Substation Operator	$60 a Week and up
Auto Electrician	$110 a Week
Inventor	Unlimited
Maintenance Engineer	up to $150 a Week
Service Station Owner	up to $200 a Week
Radio Expert	up to $100 a Week

Jobs, Pay, Future

Don't worry about a job, Coyne training settles the job question for life. Demand for Coyne men often exceeds the supply. Our employment bureau gives you a lifetime service. Two weeks after graduation Clyde F. Hart got a position as electrician for the Great Western Railroad at over $100 a week. That's not unusual. We can point to Coyne men making up to $600 a month. $60 a week is only the beginning of your opportunity. You can go into radio, battery, or automotive-electrical business for yourself and make up to $15,000 a year.

Get the Facts

Coyne is your one great chance to get into electricity. Every obstacle is removed. This school is 30 years old—Coyne training is tested—proven beyond all doubt—endorsed by many large electrical concerns. You can find out everything absolutely free. Simply mail the coupon and let me send you the big, free Coyne book of 150 photographs . . . facts . . . jobs . . . salaries . . . opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. This does not obligate you. Send at once. Just mail coupon.

Get This *Free* Book

NO BOOKS

No Printed Lessons

Nobooks, no baffling charts . . . all real actual work . . . right here in the great Coyne school . . . building real batteries . . . winding real armatures, operating real motors, dynamos and generators, wiring houses etc., etc. That's a glimpse of how we make you a master practical electrician in 90 days, teaching you far more than the average ordinary electrician ever knows and fitting you to step into jobs leading to big pay immediately after graduation. Here in this world-famous *Parent school*—and now here else in the world—can you get this training!

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Mr. H. C. LEWIS, President
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$175 will build our beautiful, Henderson powered, high speed, steel fuselage, one place monoplane, plans $1.00. Literature 10c. Barney Snyder, Rochester, Ind.

AVIATION

SAILPLANES, wonderful performance, $425. Full scale plans, $2.50. Gliders, good trainers, light weight, $225. Plans, $1.50. Wing ready to cover, $100. Wing ribs, $29; with spars, $35. Tapered sailplane wing, $125, uncovered. Ribs, $45. Spruce rib stock, 2c ft. Descriptive literature, 10c. Aerogliders, Rochester, Ind.

DESIGNERS booklet, gives sizes in % of, wing, fuselage, rudder, fin, stabilizer, flippers, length of fuselage, how to balance ship, relation of wing and horse power loading. What you must know to build a successful plane. Price 50c. Barney Snyder, Rochester, Indiana.

BUILD your sport plane from time-tested, successful plans. Heath planes have 22 years' experience behind them —and are endorsed by pilots everywhere. Large detailed blue prints of the famous Heath parasol at only $5.00 per set clear and easy to follow. Don't take chances with plans of unproven value. 10 cents for large illustrated booklet. Heath Aircraft Corp., Dept. C L 4 M, Chicago, Illinois.

METAL type propellers for Henderson and Big V motors $9.95 each. Hibbs, Ft. Worth, Texas.

HEATH Henderson Aircraft Motors—use 50% less fuel than any other aircraft motor in the country. The only successful light plane motors in America. Can be purchased now at $100 remanufactured or $325 brand new. Completely guaranteed. Backed by 22 years of constant improvements. 10 cents for large illustrated booklet. Heath Aircraft Corp., Dept. C L 5 M, Chicago, Illinois.

HEATH PARASOLS—Now you can fly your own plane! Start building the famous Heath parasol, for only $12. Highest quality parts sent you in 11 convenient, progressive groups. Cost of parts complete only $199. Heath plans declared clear and easy to follow by enthusiastic builders everywhere. Send 10 cents today for large illustrated booklet. Heath Aircraft Corp., Dept. C L 4 M, Chicago, Ill.

LIGHT Plane motors; supplies; materials; Used Planes; Everything Aeronautical. Send dime for illustrated literature. Marsh & Cendt Aircraft Co., Colby, Wisconsin.

FORD Motored Flying Flivver easily assembled at home. Time payments. Illustrated literature, dime in coin. Federal Equipment Co., Hartland, Wis.

AIRPLANE SUPPLIES

FOR SALE pair new 18x3" S. S. lightplane wheels $15.00 with tires, tubes, $34.00. First check gets them. Our latest 30 page illustrated catalog now ready. 10c. KAMM AIRCRAFT CO., 524 12th St., Oshkosh, Wis.

AGENTS WANTED

WE START you without a dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., 435, St. Louis, Missouri.

66 MILES on 1 gallon. Wonderful new Moisture Gas Saver. All autos. I sent to introduce. Critchlow, 803-E3, Wheaton, Ill.

YOU can make big money in the Food Business. No capital or experience needed, credit given. Here is your chance to establish a permanent business of your own in territory. We furnish Free Sample Case and Free Samples for customers. Repeat orders every week. Ask now! Federal Pure Food Co., F2307 Archer, Chicago.

NEW:—Rubber Soles. Cement on instantly. Never loosen. Outwears leather. Waterproof. Sells on Sight. Big Repeater. Test at my expense. Bestever Co., 215 Irving Park Station, Chicago.

SUCCEED with your own products. Make them yourself. Formulas, Processes, Trade-Secrets. Expert Analytical Service. Catalog, circulars free. A. Thaxly Co., Washington, D. C.

BIG money daily selling Shirts, Ties, Underwear, Sox, Raincoats, Lumberjacks, Sweaters, Leather Coats, Mackinaws, Coveralls, Pants, Children's Playsuits. Outfit FREE! Experience unnecessary. Nimrod Co., Dept. 132, 4922-28 Lincoln Ave., Chicago.

GREAT success making your own products! Have others selling them. Start this fastest Big Money Business. My "Eye-Opening" literature tells how and lists Formulas, Processes, Trade-secrets of Best-Selling Specialties—all kinds—all lines. Investment small, profits immense. Start anywhere. Miller, Chemist, 1706-B Miller Chemical Building, Tampa, Florida.

AGENTS buy direct at lowest mill prices. Men's latex fast wearing, doz. $1.45-$1.85. Ladies' Pointex silk hose, doz. $4.25-$6.50. Catalog FREE. Superior Knitting Company, Dept. 54, New Haven, Conn.

YOU MAKE 300% profit selling Changeable signs to stores, six lines, three colors, cost 35c, sells $1.50. Robinson sold 18 signs in four hours. Particulars free. National Sign System, St. Louis, Mo.

YOU are wanted to Resilver Mirrors at home. Profitable business plating with patented, tableware, etc. Write Sprinkle, Plater, 850, Marion, Indiana.

AGENTS! Gold Sign Letters for store windows. 500% profit. Free sample. Metallic Letter Co., 426 N. Clark, Chicago.

BIG PROFIT putting our gold sign letters on store windows, without experience. Samples. Consolidated, 69-BA, West Van Buren, Chicago.

CALIFORNIA perfumed beads selling like hot cakes. Agents coining money. Big profits. Catalog Free. Mission Factory K, 2328 W. Pico, Los Angeles, Cal.

AUTO SERVICE EQUIPMENT

SAVE MONEY—Garage equipment reconditioned, guaranteed like new. Bargains Test Stands, Chargers, Compressors, Car Washers. Shipped trial easy terms. Box X-1001, Troy, Ohio.

AUTOMOBILES AND ACCESSORIES

66 MILES on 1 gallon. Wonderful new Moisture Gas Saver. All autos. I sent to introduce. Critchlow, 803-E2, Wheaton, Ill.

SAVE MONEY—Automatic Air Compressors, Constant Potential Battery Chargers, reconditioned, guaranteed like new. Real bargains, shipped on trial easy terms. If can use write Ken's Service, Box X-1002, Troy, Ohio.

BUSINESS OPPORTUNITIES

FANCY woods for making model and toys. Send one dollar for samples, fifty cents per price. Ross Brumbaugh, Reedsville, W. Va.

BEST opportunity for profit in 8-hour Battery Charging. Practically no investment, easy terms. Bargains in reconditioned car washer, paint spray, compressors. Write Bob White, Box X-1003, Troy, Ohio.

SELL by mail! Start your own small business anywhere. Free folder tells how. No personal selling. Everything furnished. D. Horton, Metropolitan Bldg., St. Paul, Minn.

SUCCEED with your own products. Make them yourself. Formulas, Processes, Trade-Secrets. Expert Analytical Service. Catalog, circulars free. A. Thaxly Co., Washington, D. C.

MAKE MONEY collecting money. Become a collection manager or start a paying business of your own, spare or full time. Good income. Quick results. Interesting booklet sent free. National Collectors Association, 20 Connell Bldg., Newark, Ohio.

LEARN account collecting. Good income, quick results. Interesting booklet, "Skillful Collecting" free. National Collectors Assn., 20 Connell Bldg., Newark, Ohio.

66 MILES on 1 gallon. Wonderful new Moisture Gas Saver. All autos. I sent to introduce. Critchlow, 803-E1, Wheaton, Ill.

Thank You for Mentioning Modern Mechanics and Inventions for October When Writing to Advertisers

Classified Advertisements

AMATEUR cartoonists, earn $25.00 week, spare time, copying cartoons for advertisers. Three-M Syndicate, Argyle, Wis.

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AMAZING screw-holding screw drivers! Remove, insert screws inaccessible places! Factories, garages, electricians, mechanics, auto, radio owners, buy on sight! Exclusive territory. Free trial! Jiffy, 1662 Spring Lane, Boston.

BANKRUPT SALE

BANKRUPT sale, lifetime opportunity, secure airplane parts at less than 10c on the dollar, extraordinary values. Glider seats $1.95, 13 gallon gas tanks $2.95, 25000 feet air service altimeter $3.95, hand pressure pumps $1.50, tachometers 2400 RPM $4.95, 3" red or green lenses 50c, 6, 8, or 12 cylinder aircraft magnetos $6.50, Stromberg carburetors, original cost $375.00—given away, $4.95. No junk. Everything Brand New. Box 313, Mineola, N. Y.

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THE ACE of Cartoon Courses for only $2.98. Particulars Free. Carl Anderson School, Madison, Wis.

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"EXCELLOGRAPH" Portable Rotary Stencil Printing Duplicators $39.00. Equipped. Terms, description, testimonials, printed samples, Free. Pittsburgh Typewriter Supply Co., Dept. 840 Pittsburgh, Pa.

DETECTIVES

DETECTIVES earn big money. Excellent opportunity. Experience unnecessary. Particulars free. Write, George Wagner, 2190-V Broadway, N. Y.

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WANTED District Managers. Oldest Organization of its kind in Accident and Health Insurance. Write today for information. Dept. 21, Inter-State Business Men's Accident Ass'n, Des Moines, Iowa.

FARMS FOR SALE

1600 FARM BARGAINS. Hundreds of pictures in Strout's big new fall catalog country real estate and money-making farms for sale in many states. Saves you money. Just out. Free. Write today. STROUT AGENCY, 255-VD Fourth Ave., N. Y. City.

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INVENTOR'S Universal Educator: contains 900 mechanical movements; 50 Perpetual Motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price $1.00 postpaid in U.S.A. Address Dieterich Co., publishers, 602A, Ouray Building, Washington, D. C.

FORMULAS

ANY formula $1.00; absolutely guaranteed, or money refunded. Send for free lists. Doris Chemical Laboratories, 13118 East 84, Cleveland, Ohio.

FORMULAS, Chemical Service, Analysis, Free catalogue. Hertstein, Chemist, 46 Grand Ave., Grand Rapids, Mich.

LIQUID Leather, Plastique Wood, Creye-rubber Soles, Transferine, Automobile Preparations, Including Instantaneous Refinisher and Instantaneous Battery Recharger, Cosmetics — Complete Line, Cleaners—All Kinds, Candies, Foods, 50c Each. Practically any formula, 50c. Just send 50c and name it. Catalog Free. Industrial Institute, Department 301, 64 West Randolph, Chicago.

FARM LAND

OZARKS—20 acres, timbered, poultry, fruit, berry land. Hunting, fishing. $100.00, $5.00 monthly. Hubbard, 227 Grossman Bldg., Kansas City, Kans.

HYPNOTISM

MASTER HYPNOTISM. Eighteen part course. Information for stamp. Dr. Lonk, MM-2945 North Ridgeway, Chicago.

HELP WANTED

1,000 WANTED. Address envelopes during spare time. Everything furnished. Send 10c. Mail Exchange, Box 1151M, Chicago, Illinois.

CARTER Window Washer cleans, dries, polishes. Approved by Good Housekeeping Institute. 10 sales daily net you $420.00 monthly. Write today. Carter Products Corp., 861 Front St., Cleveland, Ohio.

LIQUID WOOD

NEW INVENTION. Runs, Brushes, Moulds, Veneers, Fireproofs. On hardening returns to wood. Send ½ pound can by mail, 50c. Or stamps. Liquid Wood Co., 242 Broad St., Providence, Rhode Island.

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INVENTORS: Send us sketch or crude model of your idea. Crescent craftsmen will develop it into a practical working model. 20 years of successful experience and thousands of satisfied clients. Confidential service guaranteed. Bank references furnished. Free illustrated book, "Making Inventions Pay." Crescent Tool Co., Dept. T-10, Cincinnati, Ohio.

MOTORCYCLES

MOTORCYCLE Bargains, lowest prices, bargain sheets for stamp, special aviators supplies, motorcycle accessories largest line in America, lowest prices. Largest motorcycle mail order house in the United States. Rochester Harley Davidson Corporation, 129 West Main St., Rochester, N. Y.

MOTORCYCLES, $25 to $100, easy terms. Side car, $25; engines for airplanes, motorcycles, boats and sleds, $15 to $100. Airplane wheels, $3. New Firestone tires, $5; frames, $3; forks, $3; wheels, $1; chains, 25c. New 30x3½ automobile tires, $2. Belts, magnetos, generators, tanks, cylinders, pistons, handle bars, saddles, parts. New low prices. Save dollars. Rebuilt bicycles, $9.50. Send 50c for catalog. Price Cutter Deninger, Rochester, N. Y.

MALE HELP WANTED

GET outdoor gov't jobs; $135-$200 month; vacation. Patrol forests and parks; protect game. Details free. Write—Delmar Institute, B32, Denver, Colorado.

DETECTIVES. Work home or travel. Experience unnecessary. Write, American Detective System, 2188 Broadway, N. Y.

MANUFACTURING

SPECIALTY Manufacturing and Metal Stampings. Also want Good Patents. Safety Globe & Mfg. Co., Columbus, Ohio.

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SOUVENIR strips Movietone Photophone Talkie Film; Big list film bargains and samples all for dime. Eastin Feature Films, Dept. M, Galesburg, Illinois.

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MEXICAN Jumping Beans. Rarest Curiosity in the World. Big seller in cigar stores, at fairs, and on street corners. 200 for $2.00. H. Luplow, 1008 Indiana, La Porte, Ind.

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I BUY used correspondence school courses and used business books. Describe and enclose self-addressed stamped envelope for my offer. C. W. Young, MMI, Chattanooga, Tenn.

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PRINT your own cards, stationery, circulars, advertising, etc. Junior Press $5.00, Job presses $11 up, Power $149. Print for others, big profit. Easy rules furnished. Write for free catalog and full information. Kelsey Co., R-57, Meriden, Conn.

PATENTS OR INVENTIONS

INVENTIONS commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 582 Enright, St. Louis, Mo.

INVENTIONS WANTED—Patented, Unpatented. If you have an idea for sale, write, Hartley, Box 928, Bangor, Maine.

PERSONAL

VENTRILOQUISM by mail—small cost, 3c stamp for particulars. Geo. W. Smith, Room S-420, 125 N. Jefferson St., Peoria, Ill.

TOBACQUIT—Used by merely rinsing the mouth eliminates the taste for tobacco entirely in any form. Two dollars if successful, otherwise free. Hydrous, 1965 Fifth Ave., New York.

ROOTS AND HERBS

HERB Doctor Book—10c; 250 recipes for making herb medicines. Hazzard Company, Box 41, Venderveer Park, Brooklyn, N. Y.

SALESMEN WANTED

SELL 3A Garage door holders, simple, automatic, quickly installed. Interests garage owners, builders, everyone. Exclusive territory proposition. Knowlson-Stevenson Co., Dept. C., Ann Arbor, Mich.

$10.00 DAILY placing Pluto-Solvent Radiator Cleaner in your locality. No selling. Year's supply mailed, $1.00. 4137-24th San Francisco.

STAMP COLLECTING

STAMP Collection FREE to approval applicants. Contains Iceland, Hamburg, Confederate, Turkey, etc. 2c postage. Tatham Stamp Co., (D9), Mittineague, Mass.

CLASSIFIED ADVERTISEMENTS—CONTINUED

STAMP COLLECTING

FORTY different United States stamps with price list, 12c. Seidenberg, Baroda, Mich.

FREE: Price lists of wonderful 5-10-15 cent sets. E. Rheaume, 8951 Routhier St., Montreal, Canada.

100 Different French Colonial Stamps, 25c to approval applicants. Ohio Stamp Co., Box 249, Cleveland, Ohio.

50 Different Iceland, Hamburg, etc., 2c. 15 Confederate essays, 10c. Tatham Stamp Co., D9, Mittineague, Mass.

PENNY approvals, 5,000 Liberia, Nyassa, Congo, Sudan, etc. Also 14,000 averaging 1½c. References. Philatelic Exchange, Huntington, W. Va.

ICELAND—Set of 5, FREE to Approval Applicants. E. Johnson, Box 692, San Jose, Calif.

ALBUM, 1,000 Hinges, 200 foreign, 25 Cuba, 25 Japan, 35c. Burtis Company, Saratoga, N. Y.

300 DIFFERENT stamps 20c. Michael, 942 So. 23rd, Bellwood, Ill.

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200 Different Stamps 10 cents; big price lists; 60% discount approvals. Covert Stamp, M39 State, Rochester, New York.

96 PAGE Illustrated Stamp Album and 100 different stamps—25c to approval applicants. Ohio Stamp Co., Dept. M, Box 249, Cleveland, Ohio.

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MYSTO-CODE. Secret writing system. Great fun. Easy to learn. 10c prepaid. Economy Sales Co., Dept. N, Manchester, Iowa.

SONG WRITERS

SONG Poem Writers—"Real" Proposition. Hibbeler, D195X, 2104 Keystone, Chicago.

SONGWRITERS—Address Tommie Malie, MM4215 North Ave., Chicago.

SIGN PAINTING

METHODS used by experts. If you can sketch letters you can paint signs with our methods. Address Dufred Specialty Co. Dept. 60, 6011 Mercedes, Dallas, Texas.

WANTED: MISCELLANEOUS

MAIL us your discarded jewelry, gold, crowns and bridges, watches, diamonds, silver, platinum. Money promptly mailed. Goods returned if offer refused. United States Smelting Works (The Old Reliable), Dept. 21, Chicago.

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START in highly profitable Arc Welding business, practically no expense. Our Constant Arc Welder starts you on road to success. Easy monthly terms. Liberal trial on money back guarantee. Write Hobart Brothers, Box X-1004, Troy, Ohio.

Get a Portrait of Your Favorite Movie Star, Suitable for Framing

Every month SCREEN PLAY SECRETS, America's popular movie magazine, contains a handsome cabinet size photo of a favorite movie star suitable for framing. Here's your chance to collect a gallery of your favorite stars. You will find Sue Carol's picture in the October issue of SCREEN PLAY SECRETS, on sale everywhere September Fifth.

Boys a Bicycle for You

You can earn it easily in YOUR spare time

Do you want this beautiful bicycle? This is just one of the many prizes Crowell Junior Salesmen are given. They are a group of peppy go-getters who deliver The American Magazine, Woman's Home Companion and Collier's, The National Weekly.

You need no experience to start. We tell you how to locate readers of our magazines and furnish all material. Hundreds of boys are winning prizes and earning their own spending money. You can do the same—just mail the coupon now.

Mail this

Mr. Jim Thayer's Dept. 165,
The Crowell Publishing Company,
Springfield, Ohio.

Dear Mr. Jim:
I sure want one of your bicycles. Start me off as a salesman and send me full instructions.

My Name .....

Address .....

Town ..... State .....

5,000 Radio Service Men *Needed Now!*

The replacing of the old battery operated receivers with all-electric Radios has created a tremendous country-wide demand for expert Radio Service Men. Thousands of trained men are needed *quick!*

$40 to $100 *a week* **Full Time**
$3.00 *an hour* **Spare Time**

30 Days of R T A Home Training

Ever on the alert for new ways of helping our members make more money out of Radio, the Radio Training Association of America now offers ambitious men an intensified training course in Radio Service Work. By taking this training you can qualify for Radio Service Work in 30 days, earn $3.00 an hour and up, spare time; prepare yourself for full-time work paying $40 to $100 a week.

More Positions Open Than There Are Trained Men to Fill Them

If you were qualified for Radio Service Work today, we could place you. We can't begin to fill the requests that pour in from great Radio organizations and dealers. Members wanting full time positions are being placed as soon as they qualify. 5,000 more men are needed *quick!* If you want to get into Radio, earn $3.00 an hour spare time or $40 to $100 a week full time, this R.T.A. training offers you the opportunity of a lifetime.

We furnish you with all the equipment you need to become a RADIO Service Man!

Radio Service Work a Quick Route to the Big-Pay Radio Positions

Radio Service Work gives you the basic experience you need to qualify for the big $8,000, $10,000 to $25,000 a year Radio positions. Once you get this experience the whole range of rich opportunities in Radio lies open before you. Training in the Association, starting as Radio Service Man, is one of the quickest, most profitable ways of qualifying for rapid advancement. ¶ If you want to get out of small-pay, monotonous work and cash in on Radio quick, investigate this R.T.A. training and the rich money-making opportunities it opens up. No special education or electrical experience necessary. The will to succeed is all you need.

Mail Coupon for No-Cost Training Offer

Cash in on Radio's latest opportunity! Enroll in the Association. For a limited time we will give to the ambitious man a No-Cost Membership which need not . . . should not . . . cost you a cent. But you must act quickly. Filling out coupon can enable you to cash in on Radio within 30 days, lift you out of the small-pay, no-opportunity rut, into a field where phenomenal earnings await the ambitious. You owe it to yourself to investigate. Fill out coupon NOW for details of No-Cost Membership.

The Radio Training Association of America
4513 Ravenswood Ave., Dept. MM-10 Chicago, Ill.

The Radio Training Association of America
4513 Ravenswood Ave., Dept. MM10, Chicago

Gentlemen: Please send me details of your No-Cost training offer by which I can qualify for Radio Service Work within 30 days. This does not obligate me in any way.

Name .....

Address .....

City ..... State .....

Now! Automatic

WONDERFUL
Invention Burns Oil NEW WAY

Here, at last! An automatic oil burner that really challenges coal . . . AT A FRACTION OF PRESENT COSTS . . . on the easiest terms imaginable . . . at the lowest prices ever offered! Think! No more cold wintry mornings. No ashes to shovel. No dirt. No responsibility. Get rid of coal forever! Install America's Wonder Burner and enjoy its time and money saving advantages every winter! Do it now—while you're thinking about it.

Fits any Stove or Furnace Instantly

No matter where you live—what kind of heating system you have—hot water, air, steam, vapor—whether parlor furnace or small stove . . . or the tallest skyscraper . . . LACO FITS INSTANTLY without bricking the firebowl or injuring your furnace. Any plumber can do it. So simple many users put in their own! Do it in just an hour.

Smashes Fuel Costs Eliminates Smoke, Soot, Grease

The Laco, by means of the new indestructible Mineral Wick BURNS OIL WITH AIR, and ELIMINATES FUEL WASTE. As the oil rises in the Mineral Wick, it is converted into hydro-carbon gas—the most perfect fuel known to man—because all of it burns, giving intense heat without smoke, soot, or grease. WITHOUT WASTE. This is th exclusive, U. S. Patented Laco feature—found on no other burner—and it saves you money all winter long! FULL AUTOMATIC CONTROL! Standard thermostat with every burner. Absolutely SAFE—safer even than the ordinary kitchen range. Complies with all city ordinances. Won't interfere with radio. No noise. No vibration. GUARANTEED, AND PROVEN BY SEVEN YEARS' ACTUAL PERFORMANCE.

Sensational Low Price

Laco costs so little and operates so cheaply, it just doesn't pay to fuss with coal. Send now for SENSATIONAL LOW PRICE introductory offer, easy terms, and full information.

Griswold Model

Griswold Model . . . a complete line of amazingly low priced, cheap to operate power burners for the modern home. Burns oil with air (through the use of Patented Crystal Wick) and saves ½ the fuel costs. Siphonic gravity feed. Absolutely SAFE. EASY TO OPERATE. Easy to install. COMPLETELY AUTOMATIC. Quiet. Guaranteed. Send for complete specifications, and amazing low price.

SPECIAL LOW PRICE

AGENTS WANTED *NOW*

Make as much as $10,000 to $50,000 selling Laco's Complete Line in your community. This is the peak season. GET IN RIGHT NOW with America's fastest growing industry. BIG ENOUGH OPPORTUNITY for any man! Particularly big chance for jobbers who want large territories. Write for sensational Offer.

OIL HEAT
AT AMAZING LOW COST

WORLD'S LOWEST PRICED
Fuel Oil Burner

Now—after years of scientific study and research—Laco Model F solves the fuel waste problem on atomizing power oil burners. BURNS ORDINARY, CHEAP FUEL OIL and 24 West Coast Diesel Oil WITHOUT WASTE. SAVES FUEL AND PRICED ASTONISHING LOW — lower than any other atomizing power burner in the world. Specially designed combustion chamber scientifically extracts every degree of heat from every drop of oil by metering it drop by drop. Burns slow, low pressure flame in spiral direction, not a shooting flame that blows heat and oil out chimney. CATCHES EVERY PARTICLE OF OIL AND BURNS IT! Fully equipped with electric ignition, automatic controls, room thermostat, safety lock-out system, stack switch. Several rich color patterns. So simple, so inexpensive, doesn't pay you to bother longer with coal. Special prices if you write now!

Sales Jump Into Millions as Fuel Costs Drop to a Fraction ...

There's no more sales resistance to oil heat now! Laco—America's Wonder Burner—has revolutionized the industry. Sales last year jumped into the MILLION DOLLAR Class, as Laco cut fuel costs for owners everywhere. That's why Laco dealers are cleaning up! Think what a sensational chance this is for you! Every home, commercial building, apartment, etc., a prospect. Any ambitious man with small investment can make a killing.

Astounding Offer

IF YOU ACT NOW we're ready to make you a proposition BIG ENOUGH for any man. SPECIAL Sensational Offer for promptness.

Listed as Standard by Underwriters' Laboratories.

LACO OIL BURNER CO.
2014 UNION ST.
GRISWOLD IOWA U.S.A

HEAT *for the Smallest Home*

Heats 2 to 8 rooms, Arcolas, Hestrolas, small furnaces, and parlor furnaces. Operates on as little as ½ pint oil an hour. Sells to the mass market because low price puts it within the moderate income and for even the smallest home. Three Models. Send for Sensational Low Price!

Laco Cook Stove Burner

For all wood or coal burning stoves. Brings new happiness and convenience in cooking. Simple to install and sold at amazingly low price. Write today!

EASY TERMS

Install Laco Automatic Oil Heat before cold weather gets here. Payments later. Send the coupon now for special offer with a letter telling us the size of home you want to heat and the type of heating system.

OFFER! MAIL

ATTACH THIS COUPON TO YOUR LETTERHEAD

Laco Oil Burner Co.
2014 Union Street
Griswold, Iowa, U. S. A.

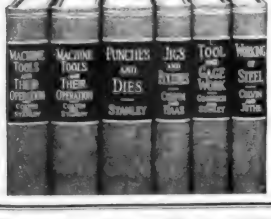
Gentlemen: Send me your sensational low price offer on Laco, the Wonder Burner ( ) Dealer Offer

Name .....

Address .....

City ..... State .....

BIG Demand for Skilled Mechanics!



These books will qualify you for a big-pay job!

The American Machinists' Library—six big volumes packed to the covers with sound, pay-raising information—puts training right within your arm's reach. The books are the last word on modern machine shop practice—the most complete, the most thorough, the most practical set of books ever published in this field. Use them to increase your earning power—to win promotion!

AMERICAN MACHINISTS' LIBRARY
6 volumes—2,000 pages—2,500 illustrations

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This Library was written from the practical man's viewpoint. Every word—every illustration is easy to grasp and apply, yet its treatment is so accurate that it is used as a constant reference work by experts in the best-known shops of the country. It explains the simple principles of shop work, then carries you quickly and surely over to the more intricate operations that every mechanic has to know in order to command a higher daily wage. Every topic is thoroughly covered to insure perfect mastery. These books are rich with the essentials of advanced methods, used by men who receive big pay for "knowing how."

They give you in convenient easily understood form more worthwhile knowledge and time-saving suggestions than any one man could possibly gain in a lifetime of practice.

No Money down--- 8 Months to pay

10 Days FREE TRIAL Just Mail Coupon

On receipt of the coupon we will send the books to you, all charges prepaid. You look them over for ten days. If you like them—send us your first payment of $1.50. The balance you pay at the rate of $2.00 a month until the special price of the set has been paid.

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., Inc., 370 Seventh Ave., New York

Send me for 10 days' free examination the AMERICAN MACHINISTS' LIBRARY. If satisfactory, I will send $1.50 in 10 days and $2 monthly until the special price of $12.00 is paid. If not wanted, I will return the books at your expense.

Signed .....

Address .....

City and State .....

Position .....

Company .....

M M1a-10

A Line from Illinois

(Continued from page 28)

that have appeared in the Flying Manual, but is principally Alco Sportplane. The ship weighs approximately 340 lbs., has a span of 27 feet, and a length of 19 feet, and a height of 5 feet 11 inches. I used the Gottingen 365 wing curve with a 5 foot chord. The little ship is powered with an Indian Big Chief motor, converted after Mr. Hodgdon's article of a couple years ago. The ship has a landing speed of 25 m.p.h., a takeoff speed of 30 m.p.h., and will cruise wide out at around 80 m.p.h. These speeds are approximate. I built the ship in about one and one half month's time. It performs very satisfactorily, in fact surprisingly well.

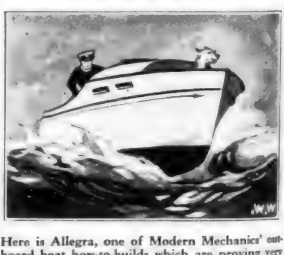
I am 25 years of age and propose to go into the aviation industry some day. Thanking you, I remain, truly yours,

James C. Hostetter.

—and that's only one of the letters I have, boys, with shots showing what America's backyard aircraft industry is doing. As I get room, I'll crowd 'em in. Something tells me the Shop Wail Box is going to be crowded out by ads this yere month, but wait a while, just wait a while.

* * *

News nuggets: gliders are popular, yes. Gliders that can be powered and later flown as airplanes, mark my words, will be the most popular. Such planes, loaded .20 h.p. to the sq. ft., are sanctioned sans anything but identification marks by the U. S. Dept. of Commerce. But light airplanes, reliably powered, are far the safest to fly.



Here is Allegra, one of Modern Mechanics' outboard boat how-to-builds which are proving very popular. She is powered with a 35 h.p. Elto.

(Continued on page 38)

A Business that is Pleasure-and Profitable —AVIATION

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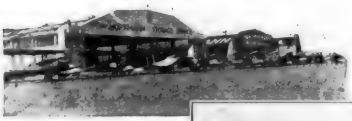

In no other business will there ever be such opportunities for GOOD men—in no other line is knowledge and hard work so well paid. The time required to learn AVIATION is comparatively short. It is intensely interesting and absorbing. Previous experience is not necessary to fit yourself for a place in this industry. Any ambitious and determined young man, who applies himself diligently will be successful.

Von Hoffmann Training is outstanding. Every phase is taught thoroughly. Instruction is given on late types of planes and with modern and complete ground equipment. Courses generously exceed Government requirements. Prices are reasonable. A liberal deferred payment plan is available for those who desire it.

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If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

---

Here's Andy's Glider Dope

(Continued from page 36)

ON a column on page 42 you will see shots of the gliders' experiences I promised I'd run this month. The shots were made by members of the New York Glider Club. One shows the unfortunate end of a Duede Glider, built from M-M plans. Inexperienced piloting did the trick. The second shot shows the humorous and genial Mr. Heath (no relation to Chicago Lightplane Eddie) going overside a la sailboat, as a gust of wind decides to tip a wing down. The wallop I got out of seeing the feather-weight sky buster ready to go places, while the peelot argues with it, is long to be remembered. But the letter is better:

Dear Sir,

In answer to your letter, I am sorry to say that we did build one of your Gliders. It was our first, and I think it was designed by Duede. You called it in your book an easy to build glider. Now that I have designed several I find that it is just as easy to build the real thing. At the meeting that was held yesterday I asked the Boys what they thought of your letter. Half of them sayed that they were supprised that you printed such a ship in your book some sayed that it was not so bad, I think that it was rotten but you print some damd good stuff that more than makes up for one bum articall, so we will excuse you and say that we should have had more sence than try to build it.

Our Secretary is sick so I hope you will excuse my try at writing a letter, I am a much better Carpenter. Just a little news about the club.

It was formed by Mr. O. Knispel and myself in August 1929. The first night it had twelve members, since then it has grown to Thirty Four. The age limit is over 18 under 80. The first ship was The Duede, a wreck in three flights. I thought the boys had lost heart but they turned out with a second in good time it was called the Blue Bird. It flew like an ostrich and lighted like a sparrow on a barbed wire fence. The third was a training ship boy that was some ship it went up like a sky rocket and came down like Comit. (Heck, I cant make this machene spell right) But with all our hard luck we have two more ships that will be ready in about three weeks, wish us luck. The trouble is that we should have experience to be able to handle these home made things, but talk is cheap if all the boys put there money togeather and I put a Quarter to it we should still be short of the price of a good Hair Cut. The dues of the club are $2 per Month One ship costs 500 but we can make Five ships for that price.

(Continued on page 40)

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in these practical books

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AVIATION

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Edited by Major Victor W. Pagé. A brand new book on motorless flying, based on practical German experience and personal experience of author, a pioneer with gliders. Explains everything about this popular sport; all types of Gliders and Sailplanes, their construction, control and launching; principles of gliding, soaring, air currents, etc. Instructions for building simple Glider, with WORKING DRAWINGS. How to form a Glider Club, etc. Get this book and enjoy one of the most thrilling and inexpensive air sports. 200 pages, 70 illustrations.
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Name .....
Address .....
Employed by .....
Name .....

Andy's Line o' Type

(Continued from page 38)

Well that is more than you asked in your letter so I will close watch for us in a few weeks.

Yours
F. HEATH.

* * *

Bend your ears to the rails, Indians! A train is coming. As you read this the FLYING MANUAL is on its way to all the newsstands in America, Bombay, Port Said and elsewhere. And just as this issue of Modish Meckaniks is replaced by the next issue, you will find on your newsstands, lo and behold, a copy of the long looked for Flying year book. Ask your newsdealer to keep his eye peeled, and chuck one under the stand for you. Half of flying America is waiting for this inimitable book! Nuff sed.

* * *

HERE'S a healthy suggestion from a gent in Arizona who has words to say anent some of Henry Ford's earlier efforts in the flivver line:

Globe, Arizona.
July 26, 1930.

Dear Andy:

I have been taking double M for some time and have enjoyed every issue; but there seems to be one thing lacking.

Now that Henry Ford has put the Model A on the road a great many of the old Model T Fords are being retired. These discarded Fords are being bought cheaply all over the nation by young men who can not afford to build a light plane or motor boat. Nine times out of ten these cars are being "stripped," and the owner builds a new body more to his liking.

My plea is for a regular department on Model T Fords. Can't you use your influence, Andy, to get the eds to inaugurate such a department containing plans for speed bodies, truck bodies, and general information on the Model T? Not overhead valves, counter-balanced crankshafts, etc., though. They mount up into money.

Sincerely,
OSCAR CRAIG FLANNIGAN.

Not a bad idee, Oscar; not a bad idee! The eds claim that M M has departments on everything mechanical as it is, and that such info as you mention should come in under our Motor Mechanics department. Maybe I can get 'em to run plans for Ford body that looks like a Packillac, or something. Anyhow, Oscar, I'm on the job, and if I don't fill your order it won't be from not trying.

"Give me your measure and I'll PROVE that you can have a body like mine"

NECK 17 In.

CHEST (NORMAL) 46½ In.

BICEPS 17 In.

FOREARM 14½ In.

WAIST 32 In.

CALF 16¼ In.

HEIGHT 5 Ft. 10 In.

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With my book I'll send you a chart so you can give me all your measurements. Then compare *your* biceps with *mine*. Measure your chest and put the figures beside mine. Do the same with your legs, arms, neck, wrist and all other parts of your body. Then get the proof of what my secret of *Dynamic-Tension* will do for you—in your home—spending as little as 15 minutes a day doing what I tell you—without apparatus—without special foods, pills, or baths—without any kind of fussy contrivance whatsoever! Give *me* 10 days and I'll give *you* the proof!

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Misadventures of a Glider Pilot

Savvy the posture of the man in the top cut? And look at the sailboat tactics of the glider peelot in the second! Read about it on page 38.

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This Offer Open to Everyone

We want you to help us select a name for a new Body Dusting Powder we are putting on the market. We feel sure you have in mind some name either simple or fancy . . . and you can suggest one after a few moments' thought. It makes no difference who you are or where you live, you can win this $1000.00 cash and a Free trip to the famous city of Hollywood by simply sending us the most suitable name for our new Body Powder at once. This is all you have to do to win. Can you think of an easier way to make $1000.00 and secure a Free Trip to the land of Movie Stars with all expenses paid? Not a thing to buy, not a thing to sell to win both of these valuable prizes . . . $1000.00 cash and a Free Trip to Hollywood.

Free TRIP TO HOLLYWOOD

For Promptness

Can you think of anything more pleasant than a trip to the famous city of movie stars, with all expenses paid—to spend a whole delightful week, have a private car and chauffeur at your command, see the show places of Hollywood, Los Angeles, and ocean beaches—observe a picture in the making, and see the famous stars? This is your opportunity. Send a name at once, be the winner, spend a glorious vacation at our expense. When it's over, return with our check for $1,000 in your pocket. If you are unable to come we will send the $1000.00 and give you the cost of the trip in cash. We hope you can come, and make this the greatest event of your life.

Any Name May Win

We have paid thousands of dollars in prizes, and usually the person who least expected to win received the prize. You, too, may win just by sending a name. It costs you nothing to try and your opportunity to win is just as good as anyone's, for any name may win. This body powder is to be used on the body just like face powder is used on the face. It is particularly soothing and pleasant after the bath, and gives the body an odor as alluring and fragrant as a fresh morning breeze from a Hollywood Flower Garden. In choosing a name you may use a coined word, such as . . . Odorsweet, Fairytouch, Rosekist, etc., or the name of a flower, tree, bird, or any other name that comes to your mind may be submitted.

Small Town Barber Wins $1100 Cash

We recently offered $1,000 for a name for our tooth paste and $100.00 extra for promptness. Larry Donnelly, proprietor of a barber shop in a small town in Pennsylvania, submitted the name ACID-OFF. He did not think much of it, so imagine his surprise when notified that the judges selected this name as winner, and paid him $1100.00 cash. Larry's future was not very bright when he entered our contest, but now, with the cash in the bank, and the story of his success on the front page of the local newspapers, he practically became famous over night. You, too, have this same opportunity; the very name you have in mind now may bring you this splendid prize and glorious trip, together with the same fame and fortune enjoyed by Larry. Wouldn't it be delightful to win? Wouldn't it be a startling surprise to your friends? Don't think you can't win for your opportunity is just as good as anyone's if you will send in a name. Do it right now! The very name you send may win.

Contest Rules

This contest is open to everyone except members of this firm, its employees and their relatives.

Each contestant may send only one name. Sending two or more names will cause all names submitted by that person to be thrown out. The prize will be awarded to the one sending the name we choose from among those submitted. Contest closes December 20, 1930. Duplicate prizes will be given in case of ties.

To win the promptness prize of a free trip to Hollywood, the winning name suggested must be mailed within three days after our announcement is read.

HOLLYWOOD MARVEL PRODUCTS CO.
Dept. 117 1023 N. Sycamore Ave. Hollywood, Calif.

Hollywood Marvel Products Co.,
1023 N. Sycamore Ave., Hollywood, Calif.
Dept. 117

Enclosed is my suggestion for a name.

Date this announcement was read .....

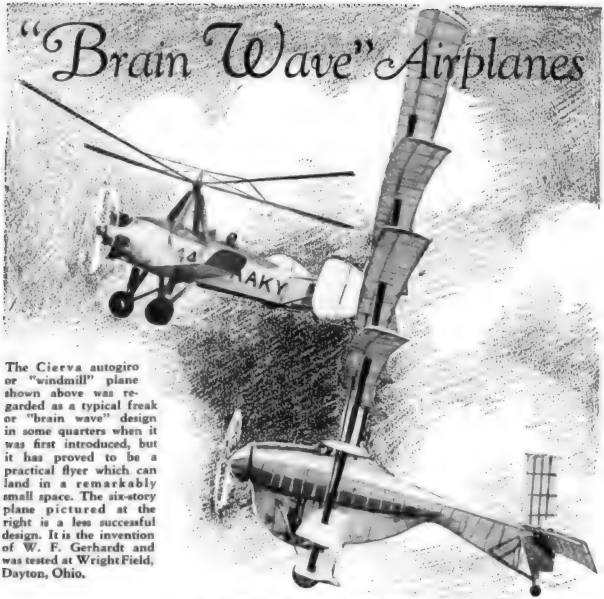
Date my suggestion is mailed .....

Name .....

Address .....

NOTE—Being prompt qualifies you for the free trip as outlined in this announcement.

"Brain Wave" Airplanes



The Cierva autogiro or "windmill" plane shown above was regarded as a typical freak or "brain wave" design in some quarters when it was first introduced, but it has proved to be a practical flyer which can land in a remarkably small space. The six-story plane pictured at the right is a less successful design. It is the invention of W. F. Gerhardt and was tested at Wright Field, Dayton, Ohio.

by **JAY EARLE MILLER**

Will the airplane of tomorrow develop out of present day "brain wave" designs, so-called because of their freakish departure from generally accepted principles? It is quite possible, as Mr. Miller points out, that the airplane of the future will be entirely different from conventional types we are accustomed to.

WHAT will the airplane of the future look like?

Will heavier-than-air craft continue to develop along present lines, with refinement of detail, or will something radically different be produced and prove better than existing planes?

When the De la Cierva auto-giro made its first appearance in England an aviation authority condemned it on the grounds that it "didn't look like an airplane" and therefore couldn't be much good.

Another authority countered by asking what an airplane should look like. There is no reason for believing, he pointed out, that because airplanes have developed along certain lines that those lines are the best, safest or most efficient. With the exception of the few planes equipped with the new Packard Diesel engine, the airplane power plant is a direct descendant of the Wright brothers' original four-cylinder gasoline

Will They Fly?

Will the airplane of tomorrow look like this? Who can tell?

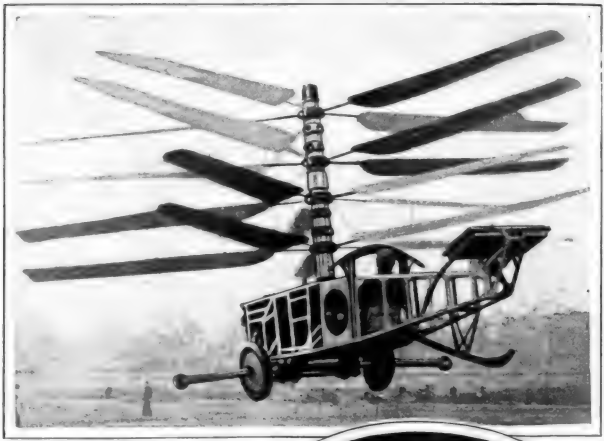
engine. The propeller has changed but little from the first one they whittled out, though there is reason to believe that a radically different type of propeller might be more efficient and is bound to come. And the plane itself is still based on the earliest models.

Helicopters, such as the one recently built in the Curtiss plant on Long Island, ornithopters and orthopters all represent attempts to get away from the standardized design and produce something new and better. A helicopter, as you probably know, is a machine designed to rise and descend vertically and hover over any given spot. An ornithopter is a flapping wing machine supposed to be a mechanical copy of a bird's wing, and an orthopter is a flapping wing machine which the inventor believes is an improvement on a bird. A famous aviation editor once described an ornithopter as the inventor's idea of how a bird's wing worked, and an orthopter as the designer's idea of how a bird's wing should work if the Creator had known anything about aerodynamics.

The Curtiss-Bleecker helicopter is unique in that it has no propeller for forward motion, being equipped with only revolving wings for lifting. The theory is that the ship will move forward by tilting its center of gravity to start it falling, while it will actually fall forward instead of down, because of the lifting effect of the revolving wings.

You can demonstrate the theory easily by holding a board or piece of cardboard in one hand, with the free end inclined downward, and start a pencil rolling down it. The pencil loses altitude as it rolls, but if at the same time you lift your hand and raise the board you can make the pencil, while falling, maintain its altitude, or even increase it.

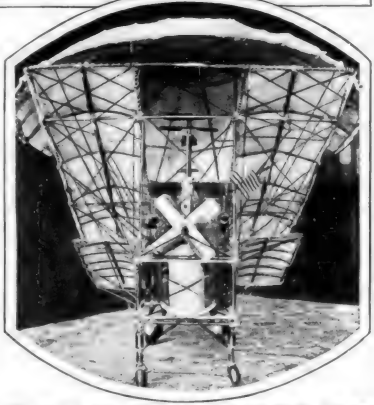
A Chicago inventor has gone even farther than Bleecker, for he is building a heavier-than-air machine which has no wings. It is a cigar-shaped metal body, approximately thirty feet long, equipped with small retractible, feathering propellers on either side. The blades revolve in drums partly



This helicopter designed by M. Pescara is shown in the air during a brief flight made from a Paris flying field. The tiers of vanes revolve in opposite directions.

within the body, and as each blade emerges through the side it is turned by a cam arrangement, sweeps downward, feathers and withdraws again into the body. There are eight blades on either side, and the surface area is extremely small.

His theory is, and wind tunnel tests have shown some reason for believing it might work, that the small, specially shaped, high speed blades will sweep the air downward from above the ship, creating a partial vacuum, and the normal air pressure beneath the ship, of 15 pounds per square inch at sea level pressure, plus the increased pressure of the displaced air, will force the ship upward into this vacuum. Altitude attained, the center of grav-



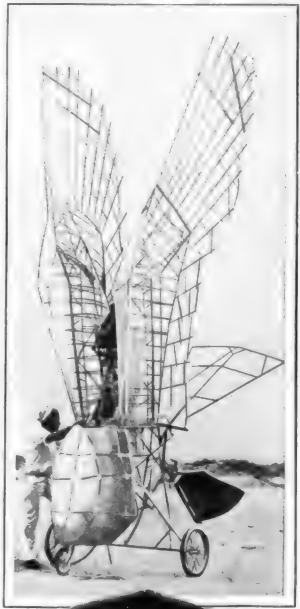
This parasol plane, so-called from its umbrella-like top, represents the culmination of ten years' work on the part of its inventor, R. H. Van Wie, of San Francisco. It is about as broad a departure from conventional airplane design as can be imagined. Note the twin propellers under the parasol.

ity would be displaced by moving a weight, and the craft would then progress forward by attempting to fall.

Of course, if the engine should stop, the wingless craft would be expected to fall like a stone. But to offset this danger he is planning to install a flywheel, revolving at tremendously high speed, in which he can store up millions of foot pounds of energy, to be used in making an emergency landing. A flywheel of about 25 pounds in weight, revolving at extremely high speed, could be used to store up enough energy to turn the propellers for five or ten minutes while landing.

An idea which has intrigued a multitude of inventors, and which is not at all impractical, is a combination of airplane and dirigible, using gas to provide a lift equivalent to a part of the weight of the plane, and the wings to provide the additional lift. Such a combination, if it proves practical, would lessen the danger of accident by stretching the gliding angle of the ship to perhaps twice its normal reach.

Some inventors have proposed utilizing the thick wing of a monoplane as a gas cell, but a simple calculation shows that any possible degree of lift attained from the amount of gas which could be stored in a wing is extremely small. Pure hydrogen weighs 5 pounds per thousand cubic feet, and air at sea level density weighs about 80 pounds, so that 1,000 cubic feet of chemically pure hydrogen would have a lifting effect in air at sea level of 75 pounds. But pure hydrogen is impractical in commercial quantities, and the hydrogen used in airships has a lift of about 70 pounds per thousand cubic feet. Helium has a lift of from



No ornithopter or wing-flapping plane, like the one above, has ever made a successful flight.

Novel in design, but a swift flyer, is this tandem-engined Bellanca airplane. Note the second propeller in the rear, in the middle of what would be the fuselage if the plane had one. The pilot sits between two motors. The unusual method of bracing the wing and supporting the tail controls is well shown in the photo. The tail sits flat on the ground, giving the ship a squatty appearance.

This plane with a paddle-wheel propeller is the invention of Ernest Schroeder, of San Francisco. The motor turns the 16 blades through a chain drive.

Inventor Ernest Schroeder with his paddle-wheel propeller.

60 to 64 pounds per thousand cubic feet.

Assuming hydrogen is used, an average monoplane wing would not have space for more than 350 to 400 cubic feet, at the most, in fact the great majority could not contain more than 150 to 200, so the lifting effect attained would be almost nil. There is no reason for believing that a lifting gas superior to hydrogen will ever be found, but even if such a gas should be discovered, no gas could be superior to a perfect vacuum, which would weigh nothing, and, with the difference in weight between air at sea level and a perfect vacuum being but 80 pounds, that is the absolute maximum which might be attained, and only 5 pounds per thousand cubic feet better than pure hydrogen.

If a plane and an airship are combined it therefore follows that the gas bag must be on the exterior of the ship.

Taking the Stinson Detroiter, six place cabin monoplane as an example of a type which might be combined with lifting gas, something of the following sort might be worked out:

The Detroiter, with Wright J-6 300 h. p. engine, weighs 2,614 pounds empty and 4,300 with fuel and pay load. Assuming a cigar shaped, metal gas bag, built after the plan of the Navy's all metal dirigible, could be attached above the wing and fuselage, with a cubic capacity equal to one-half the weight of the ship, and that the combined weight of the ship and gas bag would be held to 5,000 pounds, then a gas bag of 35,714 cubic feet capacity would be needed, as that amount of commercial hydrogen would have a lift of 2,500 pounds.

A bag of 35,714 cubic feet capacity would be equivalent to one ten feet square and 35.7 feet long. Because of the head resistance which the bag would offer to the wind its diameter should be kept as small as possible. Assuming the greatest diameter of the stream-lined metal gas container to be 12 feet, its length probably would approximate 50 feet. The length can vary greatly depending on the stream-line shape.

The Detroiter, which has a wing spread of 47 feet 1 inch and stands 8 feet 11½ inches high, has a length of 32 feet 8 inches. A gas bag 50 feet long therefore would exceed the present airplane length by 17 feet 4 inches. The nose, however, could project

beyond the propeller, and the small tail, being several feet above the tail, could project to the rear, so that would offer no particular problem.

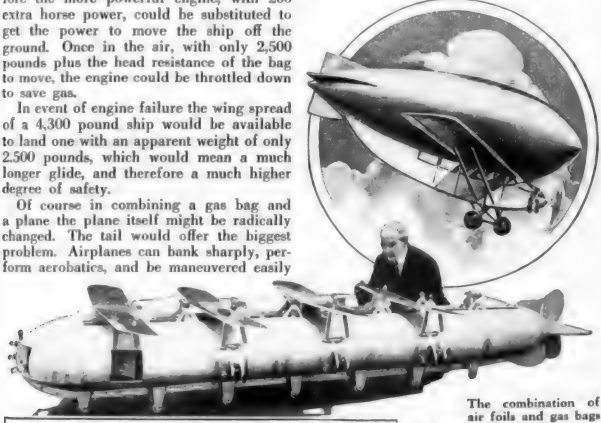
The finished ship, because of the lifting effect of the gas, would have an apparent weight of but 2,500 pounds against 4,300 for the standard plane, so less power would be required to move the weight. But the air resistance of the bag would be so great that it is probable considerable more power would be required to move the combination. The J-6 motor of 300 h. p. weighs 530 pounds, and the new 500 h.p. Cyclone weighs approximately 620 pounds. Therefore the more powerful engine, with 200 extra horse power, could be substituted to get the power to move the ship off the ground. Once in the air, with only 2,500 pounds plus the head resistance of the bag to move, the engine could be throttled down to save gas.

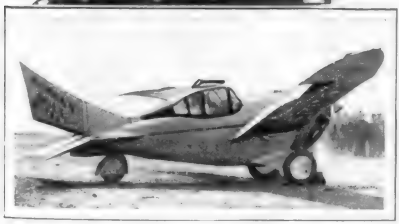
In event of engine failure the wing spread of a 4,300 pound ship would be available to land one with an apparent weight of only 2,500 pounds, which would mean a much longer glide, and therefore a much higher degree of safety.

Of course in combining a gas bag and a plane the plane itself might be radically changed. The tail would offer the biggest problem. Airplanes can bank sharply, perform aerobatics, and be maneuvered easily because the tail surfaces are placed in the slip stream. An airship, with its rudders and elevators mounted along the tail of the gas bag, and traveling at much slower speed, is slow to respond to the controls and can cut only the widest of circles.

The combination ship, because of the resistance of the bag, would be slow on the controls, which is no drawback for straight commercial flying. It is possible, therefore, that the fuselage tail might be curved upward to fit under the bag, or left off entirely, and the control surfaces mounted on the bag.

(Continued on page 172)





The combination of air foils and gas bags in a practical aircraft is one which has long held the interest of inventors. In the circle is pictured the idea described in detail in this article, in which a conventional cabin plane is fitted with a gas bag to improve its lifting qualities. Above is shown Claude H. Freese, of Los Angeles, with his model of a dirigible equipped with airplane wings. At the left is the Bonney Gull, a plane built along conventional lines but made to resemble a bird's wings and tail as much as possible. It crashed on its trial flight, killing its designer.

A Vest Pocket Movie

Above is the vest-pocket movie portrait as it comes from the camera. Twenty-five separate facial attitudes, imposed one over the other, are "brought to life" by means of a celluloid screen which blots out certain sections of the photo, as explained below. In the circle is Stanley J. Pask, inventor of the Movie-of-U machine, with electrically driven camera which takes the photos.

HAVE you ever wondered what you would look like in the movies? Well, you will soon have the opportunity of finding out—and you won't have to go to Hollywood or spend money on a screen test, either!

A New York inventor, Stanley Pask, has recently perfected an invention which is a vest-pocket edition of a motion picture studio. Al H. Woods, famous New York play producer, has financed the invention, and before long folks all over the world will be able to step into a little booth, drop a coin in a slot, and step out six minutes later with a movie of their own features.

Here's the way it works: You step into an attractive booth, built like a miniature Japanese pagoda or Spanish villa, sit down in front of the electrically driven camera, which is hidden from view except for the lens, and start it in action by dropping a coin. All you have to do then is look pleasant, smiling, closing your eyes, winking, and registering other attitudes you wish to be recorded on the finished film.

Six minutes later a folder emerges from a slot, in the shape of a little book, in the center of which, under an oval opening, appears your face. Over the photo is a piece of celluloid with a number of fine opaque lines running vertically down it, 64 of them to an inch. Moving this with the finger, ever so slightly, causes the photo beneath it to reproduce the facial expressions you assumed in front of the camera, giving an illusion of motion to the features.

How is this done? Theoretically it is easy to explain. Twenty-five different facial attitudes are snapped by the camera, and all are im-

Here's the portrait book opened up. Left section shows celluloid screen over opening; right half is portrait made up of 25 superimposed pictures.

# of Yourself

New drop-a-coin camera turns out portraits which wink and smile

posed over each other on a single photo print, which is marked off with a number of vertical lines which conform with those on the piece of celluloid. Moving the celluloid screen thus blots out certain parts of the picture, which are in turn brought out when the screen is moved further along. Like a moving picture, which is made up of a succession of "stills," it is the rapidity with which each picture follows on its predecessor which gives the effect of motion to the eye.

In practice, the main difference between the pocket movie and the full-size brand is that the miniature uses a celluloid screen to "mesh" with different poses of the picture, thus presenting them in succession to the eye, while the large machines project the individual poses on a screen by means of lights and lenses.

Booth in which the movie pictures are taken. Six minutes after the photos are snapped the completed movie is delivered through a slot.

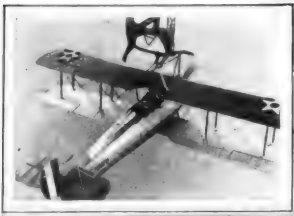
Three poses of the 25 contained in the movie portrait book are shown above. The vertical lines across the picture can be plainly seen.

Before perfecting his camera, which is called the "Movie-of-U," Inventor Pask spent two years perfecting the harmony of screens which is the secret of his machine. Just as he was on the point of completing his invention, Mr. Woods heard of it and became so interested in its possibilities that he was instrumental in forming the corporation which is now marketing Pask's machine. It is calculated that the machine will gross $90 an hour in receipts when properly located.

Already several units have been installed at Coney Island, Niagara Falls, and numerous other resorts throughout America. At this writing the Argentine rights have been sold, and negotiations are under way for sale of Mexican and Cuban rights.

Several theatres have sent in orders for machines to be placed in their lobbies. All of which helps to prove that there are still millions to be made by a man with an idea!

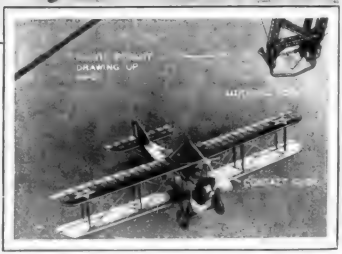
Airplane Hooks Onto Navy Dirigible While in Flight



The photo at the left, taken from the air, shows a Vought biplane hooked to the dirigible by the new de ice known as the mooring bar. After being carried several miles the plane was released.

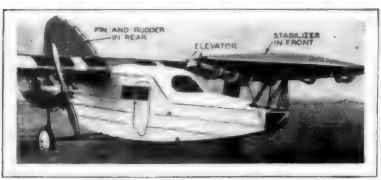
Above is shown the location of the mooring bar below the Los Angeles.

THE United States Navy has recently perfected a device which will greatly increase the range of lighter-than-air craft for scouting and bombing. It consists of a mooring bar suspended beneath the dirigible which permits an airplane to be carried, launched at the proper time, and return while the dirigible is in flight. The device was recently tried out successfully on the *Los Angeles*, several contacts being made without mishap.



The plane approaching the mooring bar. Note contact guide which protects propeller and guides hook in place.

This Novel Monoplane Reverts to Original Wright Stability Principles



A large triangular stabilizer permits low speed landings and furnishes unusual flying stability, according to its inventors.

WHEN the Wright brothers designed their first airplanes they placed the horizontal fin and elevator on a framework in advance of the wing, while the vertical fin and rudder were carried behind. The new Fokke-Wulf airplane, recently flown successfully in Germany has gone back to these first principles, placing a large triangular stabilizer on the nose of an odd-shaped fuselage. The plane is said to be foolproof.

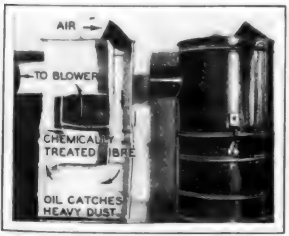
Cableless Elevator Works on Extension Arm Principle

AN ELEVATOR operating on the principle of the extension arm of a common telephone has been recently developed by F. M. Beamer of Washington. The chief feature of the elevator, a model of which is shown in the photo at the right, is the elimination of cables and overhead machinery. The cage is pushed up and let down from the bottom and moves on slots in the framework like other elevators. With this feature there is no danger of breaking cables and the consequent sudden fall. The mechanism is extremely simple, requiring only a motor to operate the collapsible extension framework, and permitting operation with but little experience. Brakes are done away with entirely. The new elevator has been approved by the Bureau of Standards and leading engineers.

The new elevator which works on the extension arm principle, eliminating the overhead machinery, cables and brakes.

Simple Air Purifier Removes Dust

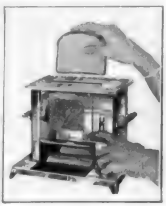
AN EXTREMELY simple air purifier that makes a valuable addition to a hot air furnace for cleansing the air noiselessly and thoroughly is shown in the photo below. The air comes first into a lower chamber partly filled with oil that catches the heavier dust particles. Thence it passes through a layer of chemically treated fibre that filters out the remaining particles. After the air has been purified it goes to a blower that distributes it to the rooms.



The simple air purifier that uses oil and fibre.

Home Toaster Turns Itself Off

MAKING toast that is tastily browned requires that the busy housewife watch the toaster closely, but with the small home toaster shown at the right, recently placed on the market, the watching is unnecessary. The lever is set for the heat desired and the current turned on. When the toast is finished it is automatically ejected from the machine.



The home automatic toaster

Three Methods to Test Fresh Fish

THREE signs by which housewives can test fresh fish have been made public by the British food board. If the color of the fish's gills is bright red and clean looking; if the eyes are bright and plump as when alive; if a little dent in the flesh made by the finger lasts only a second—then the fish is fresh.

Twenty-Three Days in

Kenneth Hunter making repairs to motor while in flight, with his brother, John, at the controls.

Flying a distance equal to one and a half times around the world, the four Hunter brothers have established a new airplane endurance record for ambitious pilots to shoot at.

BREAKING the old world's refueling endurance record by 133 hours 20 minutes, the *City of Chicago*, an old model Stinson Detroiter with Wright J-6-300 motor, has stayed in the air for 23 days, 1 hour, 41 minutes and 30 seconds.

Imagine taking off at 3:40 p. m. on June 11 and coming down at 5:31½ p. m. on July 4th after cruising for 553 hours 41 minutes and 30 seconds, and covering, at an average speed of 70 miles per hour, a total distance of at least 38,758 miles.

The remarkable record set up by the Hunter brothers, four coal miners from Southern Illinois who manned both the *City of Chicago* and the refueling ship, *Big Ben*, has again raised the oft argued question of what a refueling flight means to aviation, if anything.

To the general public refueling flights seem to mean that engine manufacture has reached such perfection that motors will run indefinitely, and therefore the old bugaboo of engine failure in ordinary operation is lifted. Actually, as any motor expert will testify, an engine carefully warmed up and then operated continuously at a steady cruising speed should last far longer than

one that is warmed up for a short flight, allowed to cool off, warmed up again, then cooled and warmed and so on for many dozens of hops.

What the Hunter flight, and, in fact, all long distance flights, do prove is that plane and engine accessory design has lagged behind the engine design. The Hunters were forced down because of trouble with the oil strainer, the oil line, the oil gauge, and the gasoline tanks. One wing tank, in fact, had been out of commission because of leaks for nearly ten days before the flight ended.

The old Wright J-6 engine was still ticking over when the ship taxied into the hangar after landing. Piston ring wear had progressed to the point where oil consumption was nearly three gallons an hour, yet, if enough oil could have been sent through the engine to protect the bearings there was every evidence the flight might have continued indefinitely.

How fuel was transferred to the City of Chicago through a sliding door in the top of the fuselage. Note the special catwalks.

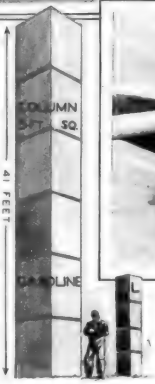
The four Hunter brothers—from left to right, Albert, John, Kenneth and Walter. John and Kenneth were pilots of the endurance ship.

The leak in the wing tank, first serious trouble to develop, is a trouble that can be avoided, as the army showed some years ago. At McCook field they developed a rubber covered tank, primarily to prevent leakage and fire danger if a machine gun bullet should pierce the tank. A gas container with a rubber cover vulcanized on the outside would be impervious to leaks developing in the metal tank seams.

The trouble with the oil lines, gauge and

The top plane in the above picture is the St. Louis Robin, previous holder of the endurance flight record shattered by the City of Chicago, shown flying below it.

Acrobatics in the air! Kenneth Hunter shown on one of his regular visits of inspection to the motor, lying on a specially built catwalk attached to the fuselage. Diagram at left gives some idea of the huge amounts of fuel and oil consumed in comparison with figure of man.



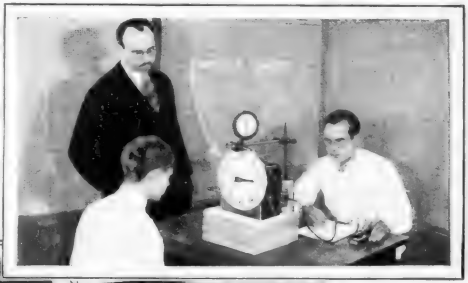
strainer, which finally ended the flight, represents a problem that has been growing more important for several years. The cure, which would not add appreciably to the weight of the ship, would be a dual oiling system, so that one could be cut out of operation for repairs.

The amount of repair work done on the *City of Chicago* while in flight was considerable. Spark plugs were changed, a magneto overhauled, and even a lost bolt in the engine mount replaced, as well as regular oiling of the rocker arms. For this purpose a light metal cat walk was rigged from the cabin doors to the engine on either side, and Kenneth Hunter, the younger of the four brothers, made regular trips to the motor. He also clambered out of the refueling door in the top of the fuselage and slid back to the tail to clear away string, paper and other debris, blown back during refueling contacts, and threatening to jam the control cables.

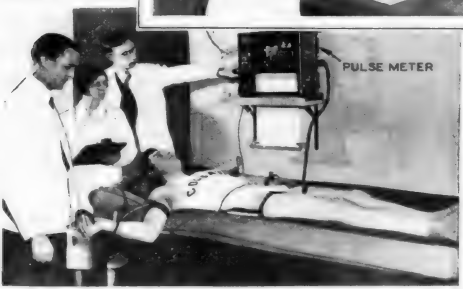
During the flight the refueling ship made 300 contacts, transferring gasoline, oil, food, repair parts and other supplies. The gas consumption totaled 7,650 gallons, an average of 13.84 gallons per hour; and the oil consumption was 380 gallons, an average of 0.685 gallons per hour. At the start the oil consumption was around 0.2 gallons, but at the end it had risen to 3 gallons.

Repairing Damage Done By Lost Sleep

Using exhausted athletes and students fatigued by loss of sleep to experiment upon, Dr. Laird, of Colgate, has discovered that doses of sugar in water will invigorate and repair the system.



In testing for mental alertness the fatigued student was required to tell the position of the hand on dial when a light flashed. Tired students gave inaccurate readings.



In this fatigue test it was found that the muscles of athletes suffering from exhaustion were very tense. Sugar brought new energy and relaxation.

SLEEP lost one night can't be entirely made up by an excessively long rest the next night, according to experiments recently made by Dr. Donald Laird, of Colgate University. In his classes in the psychological laboratory, Dr. Laird has been carrying on experiments to determine the body changes induced by fatigue and lost sleep, in an effort to find means of offsetting them.

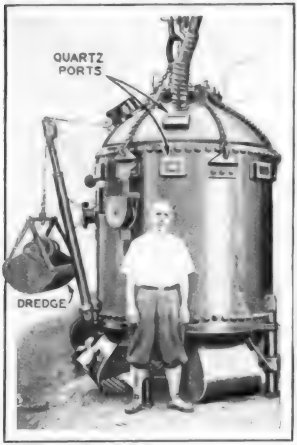
The simplest way of overcoming loss of muscular and mental energy due to fatigue, it has been found, is to drink a glass of sugar water, flavored with a dash of lemon to make it palatable. Sugar is the best of all energizing foods because of its quick action.

In measuring the results of lost sleep Dr. Laird had eight students stay up all night. The following morning he studied their reactions, and that night allowed them to get thirteen hours sleep in an effort to make up the loss of the night before. The next day the eight subjects had practically recovered their mental ability and power of concentration, but emotional reactions were still below par, the students showing a tendency toward excessive laughter, impatience, loss of temper, and carelessness of appearance.

In the fatigue tests, athletes who had been tired out on the field were required to concentrate on a dial with a moving hand and a light that flashed at intervals. When the light flashed, the student was required to tell the number at which the hand pointed. Fatigue, it was found, caused the student to give inaccurate readings.

The effects of fatigue on the student's muscular system were also tested, and showed that tiredness caused tenseness of the muscles.

Large Robot Diving Bell to Explore for Lost Treasure



The photo shows Harry L. Bowdoin with one of his inventions, a diving bell that will hold three persons and permit work at depths of 600 feet.

AFTER fifteen years of patience and industry, Harry L. Bowdoin, marine engineer and inventor of Saybrook, Connecticut, has finally perfected diving equipment which will permit him to descend to depths of over 600 feet in search of lost treasure and new scientific data.

Part of his equipment is the observation tank shown on the left. The tank is an elaborated diving bell powered with its own propellers and is equipped with searchlights to light the depths. Quartz windows on all sides permit observation.

The diving bell will be used by Bowdoin in connection with his diving suit. The diver, descending in the suit, will attempt to locate the sunken treasure from outside the bell. The necessary dredging, dynamiting, and other heavy work, may then be performed by the three men inside the tank. Owing to the enormously strong construction of the bell, the men will be able to work under ordinary atmospheric pressure.

Attorney Uses Movies in Court

DURING extended litigation in the United States Patent Office relating to glass machinery it was found desirable to acquaint the patent office officials with a client's new type of machine. It was impossible to take all of the officials who would pass on the case to the factory. Therefore, moving pictures were taken by the use of artificial lights and these pictures were shown to the officials in the patent office. They were thereby able to see the glass machines in operation, and were able to point out the particular features of importance. Without the movies it would not have been possible to have fully acquainted the patent office officials with this important invention.

In a case involving the manufacture and construction of birthday candle holders, movies were made showing the steps of manufacture of this article. These pictures were exhibited to the Court, thereby fully demonstrating the process of manufacture.

New English Car Has Rear Motor

THE sensation of the recent automobile show at London, England, proved to be the new Trojan car with the motor placed over the rear axle.

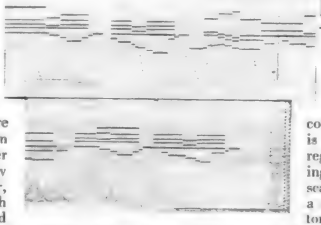
The motor is placed sidewise and on the right side of the rear end, with the gas tank above and to the left. The gear box is directly over the differential, engaging the differential gear with no intermediate shaft.

Above is shown the arrangement of power plant.

Music Writing Device Records Notes Played on Piano

IF STRAY melodies are always running through your mind and you are averse to setting them down on music paper at the moment of your inspiration, you will find this music writing piano, shown with its inventor, at the right, Dr. Moritz Stoehr, a great help in recording the tunes and keeping them in memory for publication.

The recording device, which writes on a revolving roll of paper in a series of dots and dashes every note played on the piano, consists of a typewriter attachment which can be built into the piano. A touch of the finger on the piano keys is transmitted through a system of pulleys to corresponding small levers which print on the revolving roll of paper marks proportionate in value to the time value of the note. Spaces between notes mark the time value of the rest.

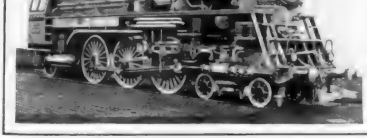


Notes played on this keyboard attached to piano are recorded on the music roll shown at left.

The typewriter-piano keyboard consists of 88 keys to correspond with the 88 keys of a conventional piano keyboard, and are compressed within a space of not over 15 inches. Each key contains a hammer, or striker, which produces in sound the note that will be recorded on the paper.

The music writer also includes a transposing device—a portable keyboard of a conventional type which is superimposed on the regular keyboard. By moving it up or down the scale to the desired key, a composition can be automatically transposed, the indirect pressure effecting the change in key. The selection is played in the regular key—superimposed keyboard does the transposing.

Locomotive Employs New Method to Generate High Steam Pressure



This new German Schwartzkopff-Loeffler locomotive, while within standard weight, develops working pressure of 1700 lbs.

A STRANGE looking engine is seen pulling enormous loads of freight cars over the rails in Germany these days. It is the new Schwartzkopff-Loeffler locomotive shown in the photo at the left, which is strikingly unique in design and operation. Its chief feature is its ability to develop a working pressure of 1700 pounds. Water is evaporated in an unheated boiler drum by means of a stream of superheated steam transferred from the grate to a superheater.

SCIENCE on the

by Lieut. Col. Calvin Goddard

Director of Chicago's Scientific Crime Detection Laboratory

as told to JAY EARLE MILLER

On St. Valentine's Day, 1929, a party of Chicago gangsters, armed with two sub-machine guns, stood seven rivals against the wall of a gang rendezvous and mowed them down. A coroner's jury was impaneled and as a result of their labors Mr. Bert Massee, the foreman, brought to Chicago Lieut. Col. Calvin Goddard, a famous expert on forensic ballistics, endowed a scientific crime detection laboratory, and placed Col. Goddard in charge. He tells here of the detective work of this laboratory.

Lieutenant Colonel Goddard is shown examining a gangland gun.

NOT long ago Leonarde Keeler, a member of our Scientific Crime Detection Laboratory staff, stood in a courtroom at Appleton, Wis., with a specially designed instrument, combining a sphygmomanometer, a cardograph and a pneemograph—the whole thing being better known as a "lie detector"—on a table before him while two defendants, charged with bank robbery, volunteered to let him test them while on the stand. Both, protesting their innocence, had previously submitted to his tests, and he had pronounced them innocent.

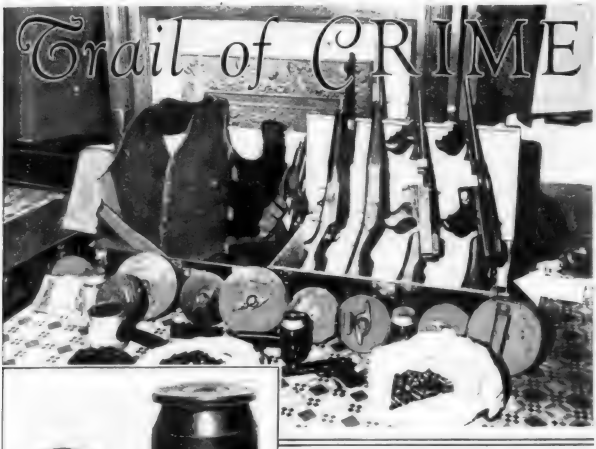
Judge Theodore Berg denied the request, on legal objections of the state, and, after eye witnesses of the robbery had identified the prisoners, the trial proceeded.

But before the taking of evidence had been completed a prisoner caught in a Minnesota town confessed he was one of the bank robbers and named the second, who was duly apprehended. When the eye witnesses saw the two new prisoners they transferred their identification to them, and the original pair went free.

Another victory for science in crime detection.

The whole story of the application of

Trail of CRIME



This arsenal was discovered in the home of gangster Fred Burke, wanted on several murder charges. The arrow points to two sub-machine guns which Lieut. Col. Goddard proved were used in the St. Valentine's Day massacre. Note the cartridge drums in the foreground and the bullet-proof vest.

Note the markings on these bullets, fired from the two machine guns shown above by Col. Goddard. Markings are identical with those on bullets taken from bodies of St. Valentine's Day victims.

science in crime detection—except as it applies to fingerprint identification—is practically a closed book to most American judges, lawyers, police, and juries. Fingerprints won recognition after a hard fight, but the "lie detector" is still frowned on by courts as a violation of the constitutional provision that a man cannot be forced to give evidence against himself.

The principle of the lie detector is quite simple, in fact, in various forms the machine is in daily use by physicians to measure blood pressure. In Keeler's development of the instrument for the determination of the difference between truth and lies the changes in the subject's blood pressure and respiration—which always accompany attempted deception—are charted by pens on a strip of moving paper.

The machine is not a third degree device, since it requires the consent and cooperation of the subject, at least to the extent of

Inspector Ferdinand Watzek, of Vienna, Austria, is the latest addition to the crime detection laboratory, shown above with his assistant. He is a "moulage" expert, which is the art of making plaster casts of objects. Note the cast of a hand in the lower right corner of the photo.

sitting quietly and holding one arm still. Denied the right to use the testimony of the machine in court, we use the detector as a substitute for the third degree. The suspect is first tested with his back to the machine, and, if the hills and dales of the chart indicate he is lying, he is then turned around and permitted to see the pen pointing out his lies as he repeats them. In seventy-five per cent of the cases where a suspect has watched the pen jump up and draw a peak on the paper every time he tells a lie a confession, which could be used in evidence, has resulted.

The lie detector did get court recognition in a rather amusing way just last week. A Chicago policeman was fined $50 in probate court for the theft of a valuable canary from the estate of a deceased person. With another officer he had been assigned to guard the effects of the woman, a suicide. The pet canary disappeared and there was a hue and a cry. A few days later a dead canary was found in the house. The officers claimed the bird had escaped, then flew back and dropped dead, but a friend of the owner insisted the dead bird was not the missing one.

The lie detector indicated that one officer knew nothing about the missing bird, but that the other did. On the strength of this, the court ordered the man to pay $50 to the estate.

Chicago is a particularly good center for my own specialty — forensic ballistics, or the legal identification of guns and bullets. While some seven-

Portable metal shield on rollers, latest aid in fighting crooks.

teen other American cities have larger murder ratios than Chicago, few receive the unfortunate publicity in connection with homicides by firearms that Chicago does, due to the gang wars. In the case which brought me to Chicago, the St. Valentine's day mas-

Here's a complete story in scientific crime detection. A Los Angeles store was robbed of some white fox furs. The heel imprint, shown in circle at left, was discovered on a piece of broken window glass. Tracing a car seen in the vicinity, detectives found it to contain white hairs which were proved identical with those in the stolen furs. Moreover, the shoe shown above, worn by suspect driving car, fitted the heel "fingerprint" perfectly. Top picture shows F. B. Gompert in the crime laboratory examining the fox hairs.

sacre, seventy shells, many bullets and other evidence was found at the scene. Examination under the microscope showed the bullets had been fired from two different guns, for every gun leaves different markings on both shells and bullets. The markings on both bullets and shells showed further that both weapons were Thompson sub-machine guns.

Nearly a year later a man involved in a trivial traffic accident in a Michigan town killed a policeman who attempted to question him, and then fled. In his home an arsenal was found, including two machine guns. We fired test bullets from the weapons, and proved they were the guns used in the St. Valentine's day affair.

Forensic ballistics is an exact science, and is so recognized by our courts. I have testified in many cases in the past several years, usually starting with a talk to the jury on gun making, showing the impossibility of making two guns which will leave identical marks on shells and bullets.

Each bullet fired from these guns bears an unmistakable individual marking which enables scientific criminologists like Col. Goddard to say with precision which gun fired the shot. This arsenal was uncovered in the room of a Chicago train bandit.

I think the most interesting case I ever had was one in Newark, N. J., some years ago. There had been a series of burglaries, all committed in the same way, by a man who entered homes while the family was away, breaking in through a basement window.

In one robbery a man and his sister were sitting in a shaded room on the top floor when they heard a noise downstairs. The man went to investigate, was shot, and died later in the hospital.

A week later a woman was found in possession of some jewelry stolen in another of the robbery series. She confessed she had received the stuff from her husband, and also admitted that in the same robbery he had stolen a gun, which he had spent some time in cleaning. On the night of the murder he had gone out with the gun, had returned breathless, with blood on his overcoat, and claimed the police had chased him and he had thrown the weapon away.

The police questioned the owner of the revolver, and he finally recalled having shot one bullet into a flower bed on New Year's eve two years before. The flower bed was dug up and screened, and the bullet found. With that bullet, and the one taken from the murdered man, they came to me.

Within a few hours I determined that both bullets had been made by the Peters Cartridge Company, that both were of 38 calibre, that both had been fired from a Smith & Wesson revolver, one from a dirty gun and the other from a gun after it had been cleaned, and that the same gun was used in both cases.

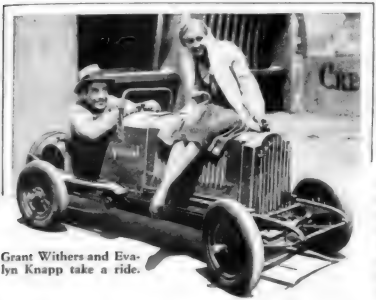
Armored motorcycles with a bullet proof sidecar containing a short wave radio receiving set are the latest weapons developed to aid police in fighting criminals.

With this evidence, and despite the fact the missing weapon was never found, we obtained a first degree murder conviction.

Our laboratory is a research institution entirely, and, while we are affiliated with Northwestern University, we do not as yet teach methods of crime detection, aside from

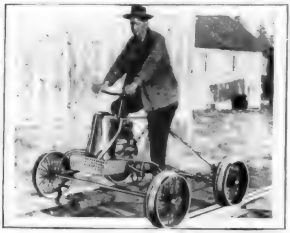
(Continued on page 186)

Novel Ways of Getting There



Grant Withers and Evalyn Knapp take a ride.

THE wheels of progress turn ever forward, but every now and then they get an added, if somewhat novel, boost from some hitherto unknown genius who labors in his back yard to make the wheels move for himself, and for himself alone.

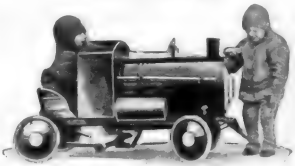


This one man train has papier mache wheels.

The photo at the upper left shows the tiny speedster in which Grant Withers defies the laws of gravity in "Penny Arcade," a picture with a Coney Island setting. This little car was made by the studio property man from odd parts of various cars.

John D. Lamey, of Hoquiam, Washington, who lives near the railroad but was required to walk five miles to town each day, decided that if the railroad would not furnish him with a train he would build one himself. Here you see the result. Four papier mache wheels, a bicycle frame and a few pieces of steel tubing, coupled with his inventive ingenuity, and Presto! The one-man train was developed.

To make a toy "locomotive," which his children could safely wheel on the streets, a motor car official of Milwaukee used an oil drum for a "boiler" and equipped it with wheels, pedals, a sprocket and chain. The addition of a stack was made possible through a piece of stove pipe.



An oil drum is the basis of this novel toy auto.

Pace Woods, of Lincoln, Nebraska, wanted a sport car that was different, so he jerked the body from his bus, had the engine overhauled, stepped up the gear ratio, and then installed a full, two-passenger airplane fuselage in place of the body. Even the foot boards are wing ribs left solid, but cut to shape and surfaced with aluminum. An unusual stability is noted at high speeds.

A real airplane fuselage forms the body of this automobile.

Typewriter Flashes Reporters' "Stories" to Newspapers

The telephone-typewriter with which the reporter transmits his "story" from scene of action.

PRACTICALLY instantaneous communication between a scene of action where news is breaking fast and furiously and the newsroom of a daily paper is provided by the new Bell system telephone-typewriter, shown in the photo at the left. The reporter at the press table or at the ringside merely writes out his story on the typewriter-telephone and the story is reproduced instantaneously on ticker tape in the copy-room ready for press. The device is similar to the typewriter-printer used by stock brokers. It is portable and can be used in any emergency. In the numerous situations in which it has been used recently it has proven its practicability, and in a matter of time will no doubt come into a more widespread use.

Glue From Toothbrush Handles

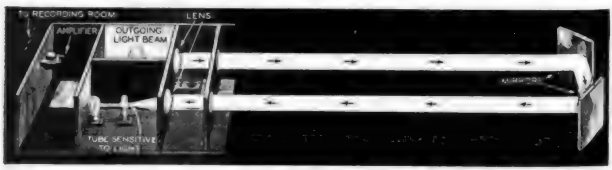
A GOOD adhesive can be made by dissolving an old pyralin toothbrush in some banana oil. The handles can be procured in various colors so as to make any color glue. It is water proof, will work successfully on fabric, wood or paper, and will not curl when used to stick photographs.

Smokes, Lighter, Case All in One

CIGARETTES, cigarette case, and cigarette lighter are all contained in one package in the device shown in the photo at the right. The lighter is mounted on the lid of the frame which fits into the package to prevent crushing.

"Electric Eye" Detects Impurities in Holland Tunnel Air for Purification

AN electric eye which detects the presence of dust, smoke, and other impurities in the air is the means by which the atmosphere is kept clarified in the Holland tunnel, the great traffic artery which joins New York and New Jersey. A beam of light from the eye is projected through the tunnel and by means of mirrors reflected back to a light sensitive tube that records all the particles of matter in the path of the beam. The impulses set up in the tube are amplified and transmitted to the operator on watch, who immediately turns on the ventilating fans, thus clearing the atmosphere.



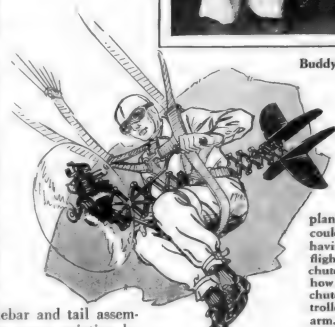
A diagram of the "Electric Eye," showing how the projected beam is reflected back into a light sensitive tube that records all impurities, thus indicating the condition of the air in the tunnel.

Cruising Parachute Driven by Motor

A PARACHUTE propelled by a two-cylinder gasoline motor is the latest safety device proposed to keep pace with the rapid development of the airplane. The idea, depicted on this month's cover of MODERN MECHANICS magazine, was on the verge of an actual try-out by Buddy Bushmeyer, veteran parachute jumper, when he was killed in an airplane accident after he had gone up without a parachute for the first time in his long career as an airman. Bushmeyer, shown at the right with his parachute motor, was a firm believer in the practicability of the idea. He was convinced that the usefulness of the parachute can be greatly increased by the addition of a motor to give it the ability to travel laterally as well as vertically.

Bushmeyer planned to leap from a plane at an altitude of 5000 feet with the parachute and motor strapped to his body. After dropping 500 feet, he assumed that the rush of air past the propeller of the motor would start it turning so that he could set the motor going by simply turning an ignition switch, operated by a series of small dry cells.

From a height of 5000 feet, it was estimated that the motor could "fly" the parachute — in reality, could flatten out its descent into a long glide—so that it could land as far as 20 miles from the starting point. The flight could be steered by turning the body and thus causing the pull of the propeller to determine the direction of flight, or by addition of a handlebar and tail assembly as suggested on the cover painting by Stewart Rouse.



Buddy Bushmeyer, veteran parachute jumper who planned to test a novel motor-driven 'chute, is shown above with the two-cylinder engine designed to be strapped to his body. He was killed in an airplane accident before he could make the test, having gone up for a flight without a parachute. The picture shows how the motor parachute could be controlled by the lazy-tong arm.

Naturally the parachute used would have to be of larger diameter than the ordinary type, to accommodate the extra weight of the motor, but in all respects other than size the 'chute would be the same as those conventionally used. Total weight of the parachute motor, designed to be strapped rigidly to the jumper's body, is kept to something less than 75 pounds. The gas tank is designed to hold one quart of fuel, sufficient to keep the four-foot propeller whirling during an 8000-foot descent. It is expected that this novel idea of a motorized parachute will receive a tryout soon.

Mapping Alaska's

Mountains and glaciers previously unseen by man were added to the Alaskan map by Navy airmen.

By LIEUT. COMDR. A. W. RADFORD, U.S.N.
Commander, Alaska Mapping Expedition

The commander of the aerial expedition which Uncle Sam sent to Alaska to map the untold wealth of natural resources in that all but unknown country, tells here the fascinating story of airplane flights over vast mountains and glaciers and endless forests to uncover the natural wealth of this rich territory.

ALASKA'S greatest wealth—not gold, but natural resources existing on the surface of the earth—stand revealed to man through the medium of four navy airplanes, sent north recently to map 12,000 square miles of southeast Alaska.

Vast fortunes in the form of timber supply and water power one day will be contributed to the United States by Alaska. Most of these will be made available through airplane survey. I recall during our nearly four months' mapping expedition that one reconnaissance will have saved for a power company at least $600,000, more than twice the cost of the expedition.

Three lakes were known to exist in an area about 20 miles from Juneau. The company affected had planned to run a power line those 20 miles. This would have meant a tremendous cost in construction and much trouble and expense in maintaining the high tension lines during winter.

Because of the virtual impassability of the country they did not know that they could find water power almost at the very back door of Juneau. By airplane we found the second source and thus will save the long and costly line.

One of the greatest fortunes of the future in Alaska will come from the vast timber supply. Our mapping duties were confined largely to the Tongass National Forest. In this alone, which comprises nearly all of southeast Alaska, there is sufficient timber

Fortunes from the Air

Commander Radford and crew of flying photographers with the quadruple-lens cameras used on the expedition.

Loening amphibians were used by the expedition.

to supply one-third of the newsprint for all the American newspapers and magazines perpetually. The forest will restock itself naturally at a rate sufficient to permit this great supply.

While ground surveyors have discovered much about Alaska's potential resources, aerial surveys reveal more in a day than some ground surveyors can learn in a decade.

On one occasion, in mid-August, one of our planes discovered a lake capable of hydro-electric development of nearly 25,000 horsepower throughout the year. The lake is located on the east shore of Taku inlet between Greeley Point and Jaw Point, only two and one-half miles from the beach.

It was apparent as soon as negatives were developed that the lake was not shown on any existing maps and that it previously was not known.

The importance of the find in connection with the establishment of a pulp mill was emphasized later by Mr. B. F. Heintzleman of the Forest Service. Mr. Heintzleman commented that the discovery of that lake alone far outweighs in value the total cost of all air surveys in southeast Alaska.

Much of Alaska's future wealth will re-

Typical Alaskan Coast Hills Provide Much "Perpendicular" Scenery

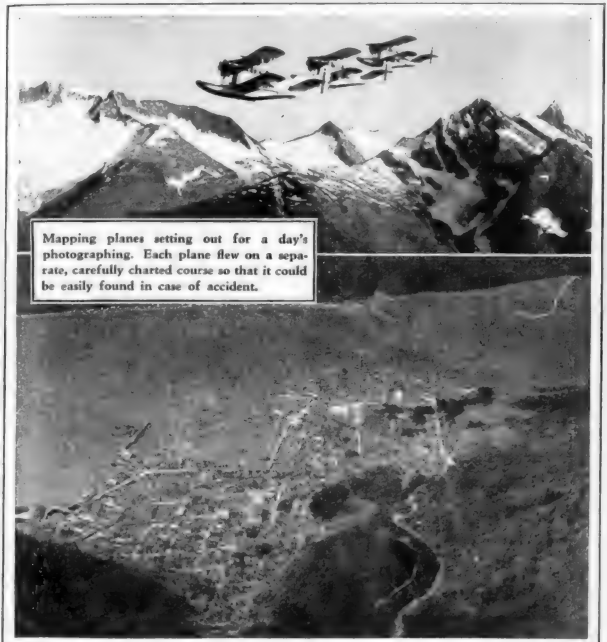
Navy observation planes, provided for possible rescue work, anchored in the river near Juneau.

main undeveloped unless an international road can be built jointly by the United States and Canada. We were able to survey briefly a tentative route for such a highway. This would permit easier egress and ingress.

During the nearly four months we spent in Alaska there were only 20 days on which mapping runs could be made. Approximately 51,000 exposures on 19,200 feet of film were made as the Wasp-powered Loening amphibians cruised at an altitude of 11,000 feet.

The mapping runs ranged in length from about 10 to 50 miles. Most of the flights were made from east to west across the islands and perpendicular to the coast on the mainland. While some of these carried

Jagged Mountain Tops, Endless Forests Made Flights Hazardous



Mapping planes setting out for a day's photographing. Each plane flew on a separate, carefully charted course so that it could be easily found in case of accident.

The four mapping planes were unloaded from the boat at Juneau, shown in photograph above.

our planes over country where a landing would have been either impossible or would have set the crew down on ice or in a wooded area possibly 150 miles from the base, no accidents occurred to mar a perfect record. We had planned carefully all details of rescue should a plane be forced down. Each plane on a mapping flight followed a route carefully charted and in case it did not return soon after the prescribed time other planes would have gone out searching.

In most of the regions the pilot of a plane in distress would have tried to land the plane in the trees, on the ice or on a lake. Each plane carried a smoke apparatus and emergency rations sufficient to feed the crew until rescue planes should arrive.

We carried an interesting development in aerial survey in the form of a quadruple lens camera with which the pictures were made. This camera was invented by Major J. W. Bagley, U. S. Army, formerly of the Geological Survey, Department of the Interior.

Each of these cameras, which weigh nearly 100 pounds, contains four lenses

(Continued on page 196)

Plumber Recovers Jewels From Drainpipes as Vocation

John Graber, champion jewel rescuer, employing one of his methods of recovering valuables.

TO John Graber, a plumber of Salem, Oregon, goes the world's record for recovering jewelry lost down drainpipes and sewers. To date, he has saved $25,000 in jewels that would have otherwise gone the way of common garbage.

Graber, shown at work in the photo at the left, is considered an expert in his field, and his reputation has spread so widely that he makes trips several hundred miles to rescue diamonds that accidentally slipped off her finger while milady was washing her hands.

The work taxes his ingenuity to the utmost. He must uproot drain pipes and knock down plumbing in order to locate the lost jewel.

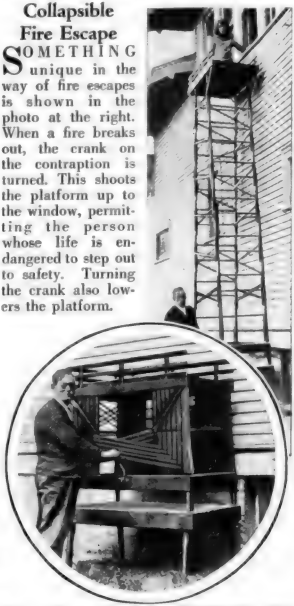
Ford Tire Rim Makes Hose Rack

A SERVICEABLE rack for holding garden or garage air hose may be made with an old Ford clincher type rim and a few bolts. The rim is cut in two with a hack saw and fastened to the side of the house, as shown in the photo at the left. The rim is anchored by means of two large bolts, which, passing through the wall, are secured on the other side by nuts over iron straps. Small bolts run through these large bolts and through the rim.

The hose is looped over the rim when not in use.

Collapsible Fire Escape

SOMETHING unique in the way of fire escapes is shown in the photo at the right. When a fire breaks out, the crank on the contraption is turned. This shoots the platform up to the window, permitting the person whose life is endangered to step out to safety. Turning the crank also lowers the platform.



Turning the crank on this collapsible fire escape elevates the platform to the level of the window.

Smallest Outboard Motor Weighs Only Eleven Pounds

Instead of the usual crankshaft, this tiny air-cooled motor is equipped with an eccentric wheel.

Front view shows throttle and starting wheel.

MOTORBOAT enthusiasts who like a handy little motor will find it in this new invention, a product of the Zaschka Works of Berlin, Germany.

Instead of the usual crankshaft, the connecting rod of the single cylinder is hooked up to an eccentric wheel that has exceptionally large ball bearings. The motor is mounted on a felt base and is capable of developing a speed of 10 miles an hour with canoes or light boats. It develops one horsepower.

Cold Milk Sold by Slot Machine

THIS mechanical cow, which has been christened "Vendicator," dispenses half pint bottles of ice cold milk for either ten or fifteen cents. All one has to do is to drop the necessary coins in the slot, turn the handle, and the bottle of lacteal fluid makes its appearance at the proper opening.

Deposit is refunded when empty bottles are returned.

The original price includes a deposit on the bottle. Should you prefer your change to the container, you merely place the bottle in the other opening, turn another handle, and the bottle disappears. Then you reach into another little door and get your money back.

The designers claim it will reject slugs, will count the bottles and return your money if the machine is empty.

Something Unique in Lighters

THE electric cigarette lighter pictured in photo at the right is so constructed that it lights when tipped, and is balanced in such a way that it rights itself automatically when placed on any level surface.

NUTTY INVENTIONS

Some of Ed Wynn's numerous successful nutty inventions are shown here for your entertainment.

to Make You LAUGH

ED WYNN
Famous Follies Funny Man, confides in ALFRED ALBELLI his secrets of nutty inventing which have made him the stage's highest paid comedian

Ed Wynn in his role as inventor doing research work in his library. Sketch at left shows his "laffometer" for measuring mirth, his only foolish invention which never made money for him. He invented it in Chicago, and says he never made a nickel off it because he couldn't find anybody there with a sense of humor.

PARADOXICAL as it may seem, there is an inventor in America who reaps a fortune every year out of the most foolish contraptions you ever laid your eyes on. Their only usefulness is for a good, full-blasted laugh.

Ed Wynn, the famous comedian, cashes in $150,000 a year by virtue of being "the perfect fool" of the American stage. The sobriquet of "The Perfect Fool" was thrust upon him as he played that particular title role in a musical comedy. But Mr. Wynn has his serious—and idle—hours. These he devotes to experiments in his workshop at his Long Island home.

Already he has patented 110 inventions, covering everything from soup to nuts, and that's speaking literally. Only once in his career has the department of patents turned down his application for rights and that was on a trick alarm-clock.

"I thought I had a great idea there," explained Ed Wynn. "You see the American man was being disturbed by a great problem. Now I'm talking real serious, mind you. I get $3,000 a week from Mr. Florenz Ziegfeld for talking seriously, though any dope knows that I'm not really serious, don't you know.

"Well, what I started out to say was that the predicament of the everyday mortal surrounded that famous American pastime called "The Nap." A man desires to take a nap for, let us say, just a half hour. Hmm. He fixes the alarm clock for a half hour. But you know sometimes not even a cannonball could budge a napper. The problem is really serious.

"The way I tried to explain it to the Patent Office was this: I have experimented with candles extensively and I have finally succeeded in gauging the length of candles so perfectly that I have one brand which burns for one-half hour, another which burns for one whole hour. I will explain later why it was impossible to use a two-hour candle.

"Now with this one-half hour candle, for instance. Before you fall asleep, stuff this candle gently into the ear, then light the

One of Ed's simpler inventions, which gets a big hand on the stage, is this oversize sword and scabbard which takes two hands to manage.

other end, and doze off. It will burn for exactly a half hour and I have found that in every case the subject is roused from slumber when it burns down to the bottom.

"I didn't get a chance to try that one out on the stage, however. Personally, I don't happen to be fond of naps while I'm on the stage. But take that piano-bicycle, or if you want to put the horse before the cart, call it a bicycle-piano, which I have been using in Ziegfeld's 'Simple Simon' show.

"That's my invention, which Mr. Patent Office himself will acknowledge. This machine consists of a piano attached to a bicycle. I sit on the bicycle part and propel a lady, who sits on the piano, about the stage as I serenade her. That always gets me an encore at every performance—and already I have made $10,000 on that one. I love to invent.

"You see, a star can let the writers of the show and the director do all the brain-racking and all that if he wants to, and a lot of 'em get away with murder. But I kind of like to throw in a lot of fool inventions.

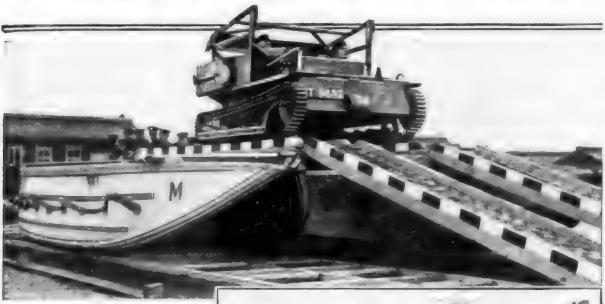
"In the last show I was in I think I had a corker, judging, of course, from the thunder of laughs I used to draw with it. I used to come out with a very melancholy mug and play some very sad song on a fiddle. On the last chord, a cuckoo used to pop out of the bottom of it and squeak.

"In my latest show I also played the title role of Simple Simon, just a nice simple guy, full of tricks which I bet make you inventors out front there wonder if I didn't study higher courses in engineering at some time or other. Take a look at that horse we trot out before you.

(Continued on page 194)

Here's Ed playing doleful music on his violin—a special instrument out of which, on the last sad note, pops a cuckoo bird—whistling!

Building Bridges in Ten Minutes



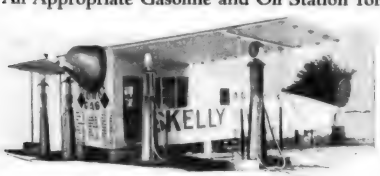
Two folding pontoons, and material needed for the bridge they will support, are carried on tank.

BRIDGE building in peace time is an engineering task usually undertaken with great deliberation; but the erection of an emergency military bridge for the purpose of fulfilling some tactical mission is a job which requires the ultimate in speed, especially when done under fire.

Opening the collapsible pontoons is only a matter of seconds.

To meet such emergencies in the British Army, the Royal Engineers are equipped with armored caterpillar tractors which carry a complete bridging unit consisting of two collapsible pontoons with all the necessary stringers, flooring and tackle. It is all part of a day's work for a trained company to bridge a river 100 yards wide, using ten or more pontoons, in ten minutes.

An Appropriate Gasoline and Oil Station for These Air-Minded Days



The spinning propeller, lighted at night, catches the eye.

THIS gasoline service station, an exact reproduction of a huge airplane, is attracting considerable attention near Topeka, Kansas. The office of the station is in the fuselage, the outspread wings furnish shelter for the gas pumps, while the tail of the fuselage is used for storing accessories. At night the station is illuminated by multicolored lights.

Angling for Wild Elephants With Rope and Bamboo Pole

The native captures the wild elephant by snaring the loop of rope around its hind foot as shown.

Meter Tests Effect of Auto Ride

YOUR Uncle Sam down Washington way has recently perfected a curiosity in the field of automotive devices—a wabblemeter which measures the motorist's loss of equilibrium due to muscular and nerve fatigue after an all-day journey by automobile.

Meter measures loss of equilibrium after riding.

Motor car manufacturers have long known that strenuous cross-country travel causes temporary loss of balance, both in the case of the passengers as well as the driver. Science in its determined quest of what causes this condition sought an instrument which would detect and measure this loss of balance. Hence the perfection of the wabblemeter, which is shown in the photo above.

GREAT danger and intense thrills are involved in the hunting of wild elephants in Annam, French Indo-China. Natives, especially trained for the work, capture the beasts with only a long pole to which is attached a small noose. The ill-fated pachyderm is caught by snaring the loop around his hind leg, as shown.

Machine Sorts Eggs Rapidly

THE task of sorting out eggs according to size, class and weight is immensely accelerated by this new machine which was recently exhibited in Germany. The eggs are fed into a hopper and the machine does the rest.

Eggs fed into hoppers are sorted out into grades.

Champ Cuts Cigarette in Two to Show His Skill With Fly

BILL VOGT, world's champion fly fisherman, is so skillful at casting flies that he can cut the tip from a cigarette with a number 10 trout fly and fly rod at a distance of 75 feet.

He performs this amazing stunt with the same ease and skill with which he extinguishes the flame of a match held in a man's hand, cuts bananas in two, or lifts the cork from a bottle. In a recent test he performed the feat of hooking a 28 pound test line into the belt of a swimmer 100 feet off shore.

At 75 feet Bill Vogt, champ fisherman, cuts the cigarette in two with No. 10 trout fly and rod.

Autos Reduce Lockjaw Infection

IN SPITE of the enormous number of cuts, scratches and bruises for which automobiles are responsible each year, the automobile must be credited with the great decrease in the number of cases of lockjaw in the United States in the past ten years.

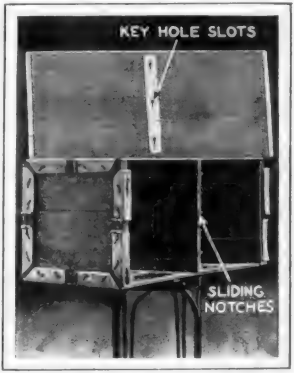
Not that automobiles have any direct effect on the lockjaw germ. What has happened is that autos have displaced millions of horses, and the lockjaw germ is the normal inhabitant of the digestive system of the horse.

In the old days, when horses were common, these germs were scattered by billions everywhere in the soil and dust, and any cut or scratch was likely to become infected with these germs.

Nowadays with fewer horses to scatter the germs, there are fewer infections.

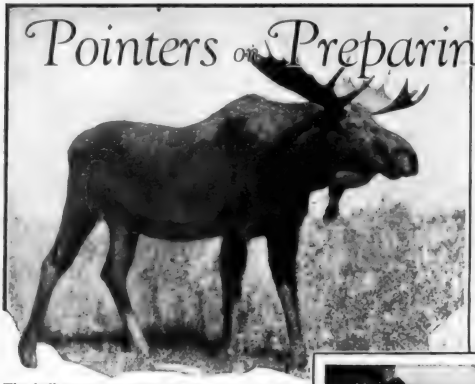
Crate May Be Used Many Times

POULTRYMEN will no longer be compelled to buy egg cases for each shipment of eggs, for there are now available on the market egg cases which can be used over and over again. These collapsible cases can be knocked down and shipped back to the shipper in bundles.



This new egg crate can be knocked down and shipped back to the poultryman for use again.

Pointers on Preparing for the



For the true American sportsman, there is no thrill like hunting the mighty moose and bear in their wilderness haunts. Here are a few tips that will aid in making the hunting trip a success.

The bull moose, monarch of the forest, at bay.

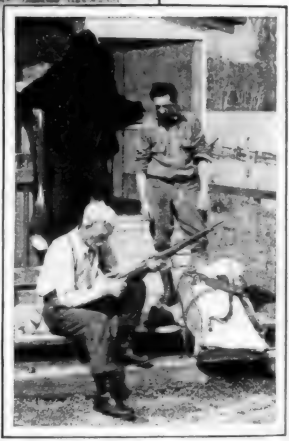
MUZZLE straight out in front, huge antlers appearing yards wide, there stood the bull moose on the sand bar projecting into the lake, gazing about for his mate. The thrilled hunter took steady aim, gripping the high-powered rifle.

"Ping! Ping!" shrieked the shooting iron as it hurled two bullets in quick succession. A crashing, tossing, threshing sound in the bushes, followed by a gasping sound, then a deep-throated bellow. Up! up! reared the monarch moose, to bury his horns deeply in the sand. Thus he died, and the hunter found a 900-pound trophy and a beautiful pair of antlers awaiting him, when he peeped through the brush.

Early fall finds millions of hunters entering the wilderness in quest of big game. This is the season when the lordly moose, monarch of America's big-game animals, may be heard bellowing a hoarse challenge far and wide. And this is the season when we may follow the most thrilling hunting, for the "Calling season" is open.

By slipping a piece of bark from the poplar tree, say a foot square, rolling it up into an improvised horn, we may utter the imitation seductive call of the moose cow and thus bring the bull moose within range of our rifle.

As the sun drops down and the shadows of evening cast long silhouettes of trees across the shining surface of the lake, we paddle, with our guide, to some prearranged spot, keeping well within the shadows and making not the least noise.

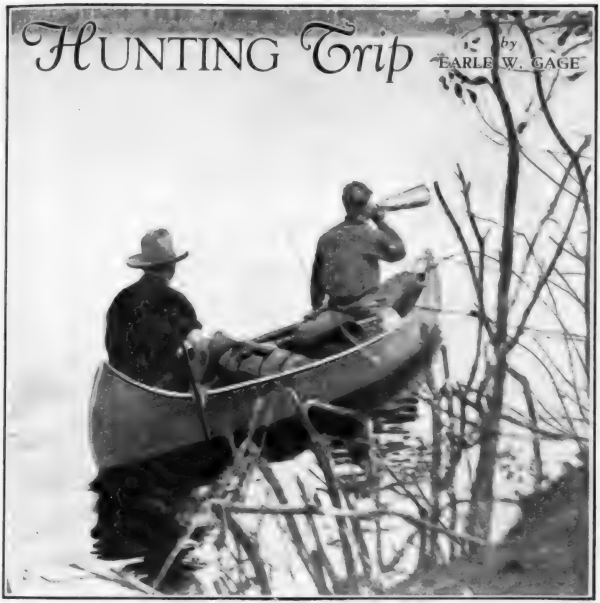


Elaborate equipment is not needed on your trip. A good rifle, a duffle bag, and comfortable clothing as shown here, are the main items.

"Ooh-aah-uh! Oooh-aah-uh! Oo-h-aah!" resounds through the forest stillness, as the

HUNTING Trip

by EARLE W. GAGE



An improvised horn, made from the bark of white poplar, can call the bull moose within easy range.

guide, by use of the birch-bark horn, utters the call. Then the men patiently wait for several minutes.

Again the guide moistens his lips and, raising the horn to his mouth, utters the low guttural, throaty "Ooh-aah," "ooh-aah." Several more minutes tick away, though it seems hours, and still there is no response. Finally the calls are answered by a wandering bull moose, resulting in his ruin.

The experienced moose caller calculates the interval between the third and fourth calls by the length of time it takes the moose to answer the first three. This tells him how far back in the forest the moose is, and when to make the other calls. This all requires patience, for the men may need to wait two hours or more, before the old bull stands on the point, ready for the kill.

"What shall I take on my hunting trip?" is a question often asked and seldom answered. Experienced woodsmen answer, "Take as little as possible, yet everything you actually need." Not very satisfactory to the inexperienced hunter.

As to clothing, it is important to wear light weight woolen underwear while shooting or fishing. This will prevent colds. Two suits of two-piece underwear are best. Heavy hand-knit socks are superior to factory-made. At least six pairs should be carried by each sportsman. Two pairs of medium-weight soft finish woolen trousers cut after the fashion of loose riding breeches, and lined with waterproof material at the seat and knees; belt, suspenders,

An experienced woodsman doesn't carry tent poles. These are cut at each camp site.

A trophy like the one shown will be ample pay for days of stalking.

waistcoat and a good stag shirt, is a better outfit than any hunting suit.

A good sweater and a very light waterproof can be added. Flannel shirts with extra large pockets, moccasins of the "still-hunt" type, with a quarter-inch pad of harness felt insole. Moccasins should be about ten inches in height and laced with belt lacing. One good pair of mittens is better than gloves. Putting pads inside the shoulders of the hunting shirt, about four by six inches in size, assists in packing and making portages, and relieves the strain on the neck muscles.

Next comes the important matter of shooting-irons. The best rifles have a low trajectory and are capable of bone smashing shots. Of the lever-action models, the "30-40," "33," "45-70" highpower are good; of the bolt-action rifles, the Springfield "06-220" grain bullet; the Ross "280"; Newton "30"; Jeffrey "33"; Mauser "8mm," and "9mm"; Mannlicher "8mm" and "9mm." The Remington "35" has also done good work. Two good Express models are the "360" and the "303-75." Perhaps the best all around stock rifle for general use is the "33."

All rifles taken on the hunting trip should be fitted to the hunter using them and should preferably have gold or ivory bead and a Lyman receiver sight in addition to the open sights. The steel cleaning rod with crystal cleaner is most satisfactory combination for keeping the guns clean.

The U. S. Army sling is the best model for use in the woods, as it permits carrying

the gun with ease on hikes or when making portages.

The best method of carrying surplus shells is to sew a strip of denim to the waistcoat, allowing one long loop for each shell pocket.

And do not forget a good pair of binoculars, as these are always needed on the hunting trip. Eight-power glasses with a wide field are best. When in the open they should be slung from a short strap and tucked inside the throat of the hunting shirt.

Bedding will be needed, of course, and the best blankets are the Hudson Bay "four point,"—four pounds of pure wool to the blanket, and of dark color. Eiderdown, made to order, and weighing about six pounds are preferred by many veterans. This is equivalent to about twenty pounds of blankets. A good sleeping bag can be easily opened to air and is more or less waterproof. Otherwise, a tarpaulin of some sort will be needed. One of the best combinations is an eiderdown fitted with a light waterproof envelope, and a comfort sleeping pocket which may be had at any supply house.

Several good duffle and pack bags are needed in every hunting outfit. These should include at least a dozen large models of waterproof food bags. If the trip is to be made in a canoe for any distance, secure a kapoc and attach to all duffle bags; this makes the bags non-sinkable if the canoe overturns, and may prove a lifesaver if the accident happens far back in the forest. One or two good pack-straps and one small bag pack for carrying lunch, etc., will be found

(Continued on page 202)

A cow moose swimming the lake is an easy kill, but one which the true sportsman will never make, remembering that there will be other hunters and other seasons. Above: A trophy any hunter might well be proud of—the antlers of a mighty moose.

Your LAST CHANCE

EXPERIENCE has won out again. Sherman T. Clinger, who lives at the Y.M.C.A. in Kansas City, Missouri, is announced as the winner of Flying Contest No. 9.

Clinger is the veteran contest hound who set the judges on their respective ears in the previous contest by submitting his entry on a phonograph record. This spark of originality won for him a flying helmet as second prize, and no doubt made him realize how hot an entry must be to cop the grand award, for his entry in Contest No. 9 was a Lulu.

Second prize, a real leather aviator's helmet, goes to Charles Peter Paton, of 53 Wolseley Avenue, Montreal West, Province of Quebec, Canada; while George Luck Brown, of 3442 Third Avenue, Los Angeles, California, is awarded a pair of flying goggles as third prize.

And now for the Grand Finale! Here, fans, is your last chance to win a flying course at our expense. We have made this last contest especially easy, so that all may have a chance. There are only two questions to answer this time and neither question requires any profound knowledge of aviation. These questions will be found in the advertising section at the back of this

Sherman T. Clinger, of Kansas City, Mo., wins first prize in Flying Contest Number Nine.

Charles P. Paton, of Montreal, Canada, wins second prize— a real leather aviation helmet.

While George L. Brown, of Los Angeles, California, walks off with the third prize, goggles.

to WIN Your WINGS

issue of MODERN MECHANICS AND INVENTIONS.

You do not have to be a subscriber to this magazine in order to be eligible for the big prize. All you have to do is fill out the blank at the bottom of the page, find the two simple questions and answer them, and mail them to us together with a snapshot of yourself. Simple, isn't it?

For the best answers to the questions, MODERN MECHANICS will award a free flying course at some reputable aviation school. Railroad fare, room and board, and some other necessary expenses will all be paid. A real leather aviator's helmet and a pair of flying goggles will be awarded as second and third prizes respectively. Originality, neatness and adequacy of answers will count in picking the winners. Here's the coupon. Let's go!

WIN YOUR WINGS!

Rules of the Contest

For the best answers to the two questions that can be found in the advertising section in the back of this issue, as determined by the contest judges, MODERN MECHANICS will award a complete flying course in some recognized flying school, paying all expenses of tuition, living costs, railroad fares and for some needed equipment in the form of helmet and goggles. Neatness, originality and adequacy of answers will be the guiding factors of the judges in determining the winner. Second and third prizes will be awarded as announced elsewhere on this page. It is not necessary to be a yearly subscriber to the magazine.

Anyone may compete who is 16 years of age or over, and a resident of the United States or Canada. Members of the staff of this magazine are, of course, not eligible to enter. Address your letters to Flying Contest Editor, Modern Mechanics Magazine, 501 Seventh Avenue South, Minneapolis, Minn. Entries must be postmarked not later than October 15, 1930, to be eligible for this contest. Clip or copy the entry blank below and attach it to your letter. Fill in the information requested. Include a snap shot of yourself, if possible—a big photo isn't needed; just a kodak print.

It is not necessary to buy a copy of the magazine to compete. In case of a tie, duplicate prizes will be awarded. Fill in the entry blank, answer the questions and send in your entry now. Don't forget to include your photo!

Entry Blank

My name is .....

Address ..... City ..... State .....

Age ..... Height ..... Weight ..... Sex .....

If under 21, please answer the question below:

Will your parents consent to your learning to fly? Parent's signature .....

Attach your answers to the questions, and your photo, to this blank. Mail it before October 15, 1930, to

FLYING CONTEST EDITOR
MODERN MECHANICS MAGAZINE
501 SEVENTH AVE. S., MINNEAPOLIS, MINN.

Artist Paints Undersea Pictures Seen Through Periscope

Periscope gives the artist a view of the scene beneath surface.

PAINTING undersea scenes seen through a periscope is the unique hobby of Miss Dorothy Beck, an amateur artist who is making a tour of the world for the purpose of painting pictures of every kind of marine life. In the photo at the left she is painting some specimens of fish that haunt the waters near the shores of Ceylon. With the large upside down periscope, which projects far down into the water, she is enabled to view undersea vegetation and tropical fish in their native haunts, and thus get first hand information as to the colorful and glamorous life that exists under the sea.

Hottest Spot Is 900,000 Degrees

WHAT is believed to be the hottest spot on earth has been discovered by a Westinghouse laboratory scientist on one of the metallic electrodes of a high powered arc which is maintained inside of a special type vacuum tube used in laboratory test work. It is estimated that this hot spot reaches at times a temperature of 900,000 degrees, and is even hotter than the surface of the sun. It is impossible to measure this new hot spot directly, as the excessive heat would instantly vaporize the thermometer. Estimation of the temperature is based upon observation of the behavior of the gases around the arc.

Roughened Disc Peels Potatoes

A MACHINE to peel potatoes by virtually wearing off the skins has recently been placed on the market in Germany. The potatoes to be peeled are held against the roughened surface of the disc while the handle is turned. High speed with little waste is the chief advantage of the machine.

Potatoes are peeled rapidly by holding them against the roughened surface of revolving disc.

Portrait on Check Avoids Forging

Signature inscribed over stamp bearing picture of signatory adds safeguard against forgery.

A NEW method of preventing the fraudulent signing of checks by affixing the portrait as well as the signature to the check has recently been devised by an English bank clerk. A gummed stamp with the portrait of the signatory is pasted on and the signature inscribed over it. The bank accepts only such checks as are thus signed.

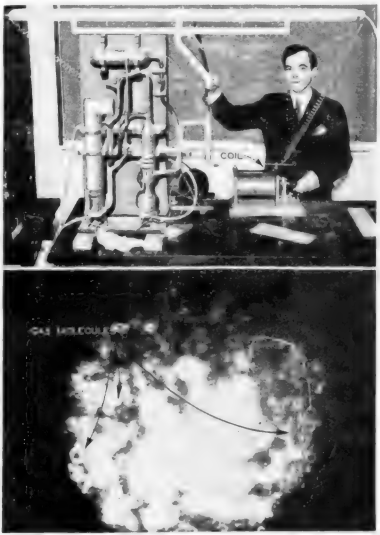
Electricity Shatters Gas Molecules for Scientific Study

THOSE infinitesimally small particles of matter called molecules are being scrutinized closer and closer every day by scientists bent upon ferreting out their secrets and ultimately discovering in them the long sought riddle of the universe.

To inspect these molecules thoroughly it is first necessary to break them up into yet smaller particles, called atoms. The photo at the right shows the system of apparatus used by Dr. Francis Bitter at the California Institute of Technology for shattering these minute particles of matter. The pump forces the gas molecules which are to be studied into the disintegrating tube. At each end of this tube is an electrode which is connected to a terminal of the high tension coil.

When a current is sent through the disintegrating tube there is a scurrying hither and thither of the electrically charged particles and in the scuffle a great number of the molecules get broken up. The extremely high pressure caused by the current sets up a bombardment of the molecules and the shock shatters them into pieces.

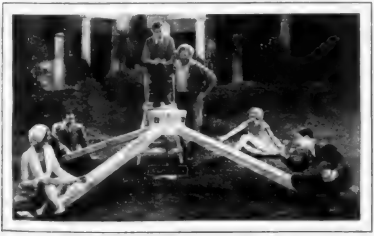
At this point the scientist brings his camera to play on the scene and gets a picture, such as shown in the lower photo at the right.



An electric current from the coil is sent through the disintegrating tube shown in the top photo to shatter the gas molecules into atoms. Lower photo shows cluster of molecules.

Hollywood's New Game

BY WAY of seeking diversion during time out from the strenuous labor of making movies to entertain the nation, Hollywood stars have devised a unique game called "Roll-in-the-hole." The ball is rolled up an inclined trough and into a large tub-like arrangement with holes in the side. The point is to spin the ball so that it rolls out the holes that count the most. At the left several well known stars are engaged in a game.



Object is to roll ball up trough through holes in center tub.

Could You Become

If you have ability as an entertainer, along with a good radio personality, fame and fortune may await you if you can pass the radio audition test, as described here.

Men with a voice and diction like that of John F. Young, National Broadcasting Company announcer, are in great demand in the radio field. Millions listen to his voice daily.

NO DOUBT everyone would get a great thrill hearing his name announced over a network of powerful broadcasting stations as the artist who will next entertain the vast multitudes of listeners-in with a song, a string of jokes, or a speech treating subjects of interest to the nation. And no doubt, also, everyone would get even a greater thrill out of receiving each month a salary and royalty check of the generous four-figure proportions that most radio entertainers pull down.

To achieve fame and fortune as a radio star, however, you must first go through a trial by fire, an audition in which your "radio personality" is given a severe test before the microphone to determine whether you can click with the great unseen audience of critical listeners-in.

With the phenomenal advance of radio as a source of popular entertainment, radio broadcasting studios have become swamped with artists who are ambitious to make a name for themselves. With Amos and Andy's salary reaching into the dizzy thousands for their radio act, with the unprecedented popularity of acts like Rudy Vallee's crooning, and with a thousand other temptations to incite the ambitious, everybody from 17 to 70, from Maine to California, wants to get on the air and achieve fame as a radio star.

The result of all this has been the establishment of a special artist bureau at each large broadcasting station. The purpose of this bureau is to give auditions to these thousands of ambitious singers or speakers.

Governing the artist bureau of the famous Columbia broadcasting station in New York are Henry Burr, famous concert tenor, and Leroy Mountcastle, who came into the radio field from the phonograph business, where he learned what music audiences prefer.

"Requests by ambitious artists to be heard at our bi-weekly auditions pour in steadily day in and day out," said Mr. Mountcastle, at an interview recently at his studio in New York. "They appear here in person, they write, telephone and telegraph. They must be heard, and it is up to us to give them a fair hearing. Since last January 1

a Radio Star?

by ALFRED ALBELLI

Everyone knows Amos and Andy; they are almost a national institution. They are drawing $100,000 a year for their radio act, with an additional $10,500 weekly from vaudeville and phonograph royalties.

we have had 2000 auditions, with about 100 applicants at each hearing."

Mr. Mountcastle then led the way to the audition quarters, the trial chamber where the applicant for a place on the air and a handsome salary goes through with his or her act. This chamber is a large, specially constructed room, with acoustic qualities as near perfect as possible. In one corner there is a piano on which reposes a vase of flowers. This gives a psychological touch, Mr. Mountcastle explained. An attempt is made to make the grim chamber appear cozy and benevolent, and not bare of all humanness.

Close to the piano is the microphone. It stands there so menacingly that one is reminded of the sword of Damocles hanging over one's head. There is no other instrument or furniture in this hall.

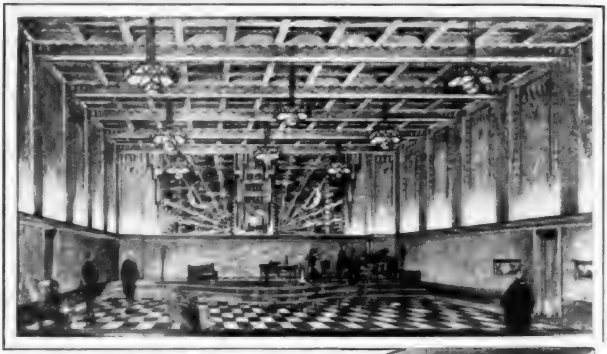
From here one passes into the control-room. It is here that the judges sit in solemn conclave and pass on the talents, or lack of them, of the person before the microphone.

A window has been installed in the wall separating these two rooms in order that the judges may glance through every now and then and behold the artist's stance before the microphone, while he listens to the voice over the loud speaker installed on his desk.

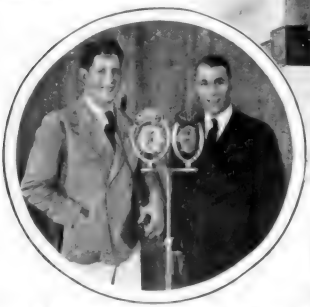
"How do we know the microphone voice? Reasonably enough," explained Mr. Mountcastle, "we have to get it over the microphone. We look first for smoothness and clearness of sound. There has to be a fine tone quality and clear diction. We have to watch and see if the voice has an edge, which breaks and causes the most uncomfortable feeling to the listener. In other words we must beware of the cracked voice.

"Our worst enemy in these radio trials is the fear complex. Sometimes during the tryout I notice that the artist is nervous and actually frightened. He seems to think the mike is going to attack him on the slightest provocation. Over the supersensitive microphone this nervousness of tone is registered in all its imperfections.

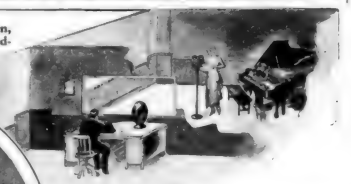
"One cannot detect a good radio voice in



The studio of the powerful Crosley station, WLW, in Cincinnati. Famous artists broadcast recitals to the nation from here every night.



Rudy Vallee, radio's most popular crooner, and Graham MacNamee, radio's most popular announcer, have perfect microphone personalities.



This drawing shows the procedure of a typical audition. The judge observes the artist's stance, while listening to the voice over loud speaker in an adjoining room.

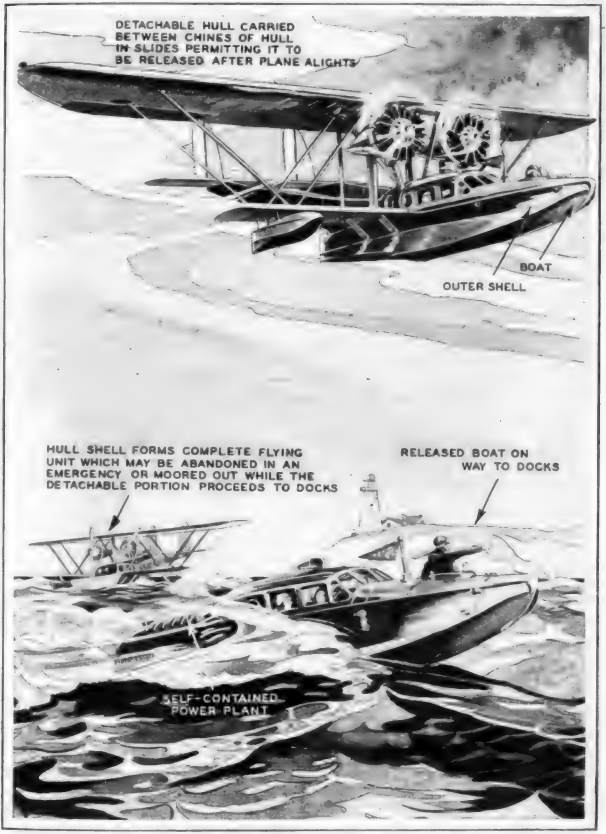
ordinary conversation; one can only judge it by hearing it over the air. The moment a prospect opens his or her mouth before a microphone we know whether they have a radio voice. A flop voice on the air is just as noticeable over the loud speaker in our audition room as is a bicycle pump voice on the talking screen. Often we press the buzzer after we have heard a single line. It's no use wasting anyone's time.

"But everyone gets a fair hearing at the radio audition. Every broadcasting company is on the look-out for first-rate talent. Radio artists of the first water are rare. Out of 200,000 applicants we got only 12 persons. But they were the best to be had, and their financial returns have been commensurate with their ability. Take Maurice Chevalier, for instance. We paid him $15,000 for four songs once.

"Lastly we have to seek out radio announcers. Geniuses like Graham MacNamee

(Continued on page 190)

Sea Plane and Motor Boat in One



Flying boats of the future may be built so that they can shed their wings and motors and become motorboats. As shown in the drawing, the detachable pontoon forms the motorboat section of plane.

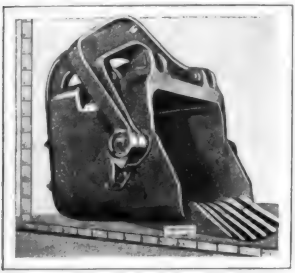
Engineer Builds Model Bridge to Study Traffic Control

Traffic conditions at the approach of the Hudson river bridge were studied with this scale model.

IN ORDER to make a thorough study of traffic conditions on the Hudson River bridge, Mr. H. E. Boucher, of New York, has built a small model of the bridge and approach that is complete to the smallest detail, as shown in the photo above.

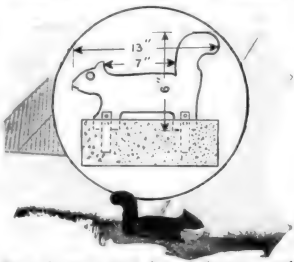
World's Largest Steam Shovel

WHAT is said to be the largest steam shovel dipper ever made, was recently built by a steam shovel company at Chicago Heights, for a coal plant at Pyatts, Illinois. The dipper is 14 ft. long, 13 ft. high and 8 ft. wide, and has a capacity of 13 cubic yds.



This gigantic steam shovel, largest in the world, has a 13-cu. yd. capacity and weighs 37 tons.

Novel Foot Scraper for Doorstep



Form of scraper is cut from thick gauge metal and embedded as shown in the concrete block.

THE novelty foot scraper shown in the drawing above will not only save the carpets and floors but will add a touch of distinctiveness to your doorstep.

The form is cut with a cold chisel from rather thick gauge sheet iron, using a piece of cardboard as a pattern. Only a rough outline of the body is needed.

Short pieces of ⅛ by 1 inch strap iron are riveted to the legs and these embedded in a concrete block which is cast around them. A rivet is put through the head as shown for the eye; and the body painted any color desired.

New Framing Jack Enables Single Man to Lift Ton Pole

Insert shows mechanism of the framing jack. The handle operates the ratchet, raising pole.

The jack lifts pole to convenient height for framing.

WHERE formerly it required from four to eight to lift a telephone pole to the proper position for framing, the same task can now be done by one man, provided, of course, he is equipped with the new framing jack recently invented by a San Joaquin lineman.

The jack is built of a cast steel frame, and weighs less than fifty pounds.

Seeder Plants Rice Crop in Water

The rice is scattered over fields with seeder.

AT THE world's largest rice farm, in California, a new method is being used in planting rice. The seeds are scattered from a sea-going trailer over fields covered with 8 inches of water, as shown in photo.

Unique Hotel Built for Coolness

Coolness is feature of the hotel shown in this photo.

AN INDIANA hotel man recently hit upon the idea of building a hotel that would not only be cool, but would announce to all the world by its appearance that it was cool. The result of the bright idea was the structure shown in the photo at the right.

The novel hotel has seven floors, and each room has an exposure unobstructed by anything that might cut off breeze, thus giving each room a maximum of natural coolness. In hot weather the hotel is a great success.

Boarding Dogs is Money-

Considerable extra money can be made by someone in every community who sets up a kennel for boarding dogs during the absence of their owners, particularly during vacation time. This article tells you how to establish a profitable side-line business.

IN ALMOST every community an opportunity exists for making extra money or even a livelihood, through boarding dogs by the day, week or month.

The standard rate prevailing in most sections, is one dollar per day or five per week. Certain rural establishments cut this in half but it is not necessary.

The first requisite for such an undertaking is a genuine liking for dogs and the ability to handle them. One does not have to be a veterinarian nor in any sense an expert. Safe, dependable care during an owner's absence is the thing to feature and offer for sale.

A boarding kennel need not take up much space nor does it require a costly investment. Individual pens for each dog and an enclosed, well-drained exercising yard are the outstanding requirements. Proper feeding, sufficient exercise and scrupulous cleanliness are the real factors for success in an undertaking of this sort. Given these three things, any dog is certain to thrive.

Dogs may be housed in one large building or sheltered in individual units on the colony plan. The former is the better arrangement of the two. A general kennel house should be well-lighted and ventilated. Pens or stalls should be at least four by four feet in size for average breeds, and high enough to permit ready access for cleaning and feeding. The partitions can be of wood or heavy meshing and there should be a top to keep the dog from climbing out. The door should fasten securely and be proof against accidental opening.

Bedding is not necessary. However, if the floor is of concrete, it is essential to have a false wooden one to prevent sickness. A sleeping shelf could be built above this if desired. In most hospitals newspapers are spread out on the floor and changed daily. Individual straw mats are obtainable at ten cent stores and could be used where the boards are too rough. If you prefer to use bedding get red cedar shavings or sawdust.

If individual runs are used, entrance is generally effected through a small slide door in the rear of the stall. This can be pulled open or shut by an overhead rope leading to the front. Where a general exercising yard is used, the dog can be led through the stall door.

Sunlight is a requisite for dogs as with humans. The exercise pen should have a southern exposure or else face east and west. The larger this is, the better for the

Making Hobby

by M. W. MEIER

Typical dog boarding kennel with hospital facilities. Good profits can be made from similar kennels which do not care for sick dogs, but specialize on boarding healthy ones.

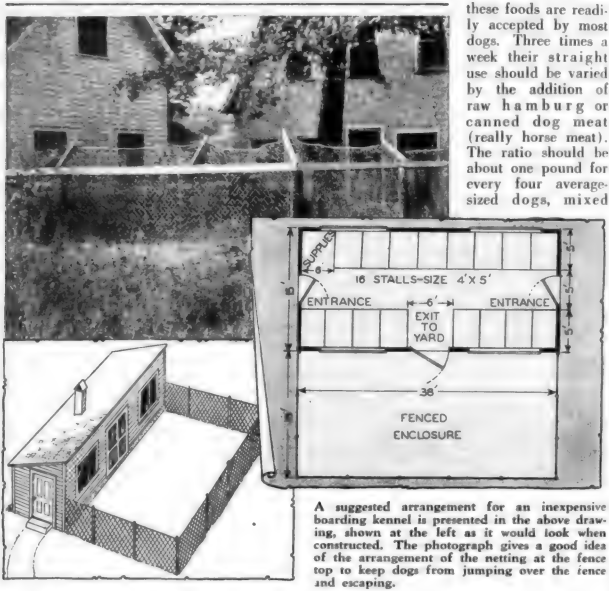
Interior view of boarding kennel, showing how the individual stalls are arranged around the wall.

health of the animal. Have it big enough to permit a dog to gallop a bit.

This yard should be carefully enclosed beyond any chance of escape by climbing over or digging out. If galvanized wire is used to enclose the yard it should be of at least 16-gauge thickness with two-inch mesh. A heavier gauge is recommended for safety and lasting qualities. Dogs have a habit of jumping up and bearing down on the wire, which soon sags and gives. It should be fastened along the top to cross boards, piping, or even heavy wire stretched between the corner posts.

Exercise pen floors should either be of concrete or well-drained earth with a slight slope. Sometimes cinders, crushed rock or even sawdust is used. Whatever the floor is,

Plan for Typical Boarding Kennel Allows the Dogs Room for Exercise



A suggested arrangement for an inexpensive boarding kennel is presented in the above drawing, shown at the left as it would look when constructed. The photograph gives a good idea of the arrangement of the netting at the fence top to keep dogs from jumping over the fence and escaping.

however, it must be kept scrupulously clean and disinfected three or four times a week. If the runway is too exposed to direct sun, some provision for a bit of shade is necessary. A strip of canvas stretched across a portion will serve nicely.

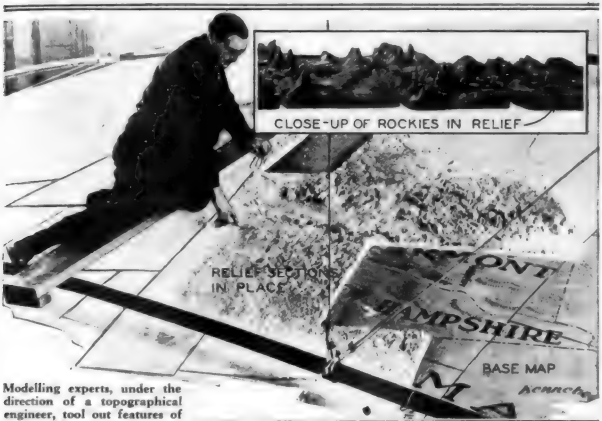
Feeding is the most important matter. Few owners properly feed their pets and a whole train of disease results. The dog is a carnivorous animal and nature meant him to subsist largely on meat. Today, properly balanced dog foods are obtainable at any feed store or direct from the manufacturer. These come in bulk or fifty and one hundred pound sacks. Prices range from five to ten dollars a hundred, depending on the brand. Their use saves time and insures correct diet.

Mixed with water, milk, or thin soups, these foods are readily accepted by most dogs. Three times a week their straight use should be varied by the addition of raw hamburg or canned dog meat (really horse meat). The ratio should be about one pound for every four average-sized dogs, mixed with their regular food. Cooked carrots or turnips should be added several times a week. At least once a week, give each dog a thoroughly-cooked beef knuckle or shin bone to gnaw on. His teeth require this.

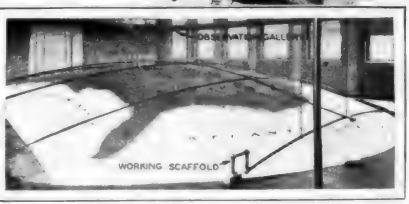
Some people only feed their dogs once a day. Authorities agree that this is wrong. Twice a day is best. The amount needed varies with the size animal and his activity. In many kennels, the rule is one-half ounce of food per pound of animal. Thus, a thirty pound dog would get fifteen ounces of food. You can tell after a few meals how much an animal requires. Don't overfeed—try never to underfeed.

To attract patronage you can either circularize a list of dog owners or use classified advertisements in one or more of your local newspapers.

Erecting World's Largest RELIEF MAP



Modelling experts, under the direction of a topographical engineer, tool out features of the relief map in sections and assemble them as shown above.



This huge relief map of U. S. has a spherical surface, and is laid out in exact proportion to the geographical features of the country.

IN THE little town of Wellesley, Mass., at the famous Babson institute, the largest relief map in the world is being constructed by men especially trained for the delicate work. When completed, the map, which is built on a spherical surface in exact proportion to the actual curvature of the earth, will show in detailed relief the whole of the United States and a large part of Canada. It is 63 feet long and 46 feet in width, and covers an area of 3,000 square feet.

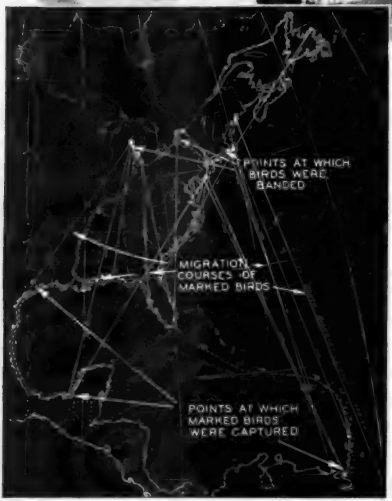
Actual work on the map has been going on for five years, with a staff of fourteen men who are under the direction of an expert topographical engineer. To date it has cost $150,000, and it is probable that the completed map will cost close on to a million.

The finished map will show all waters in blue, with the cities and transcontinental railroads in red. State boundary lines will be dark brown, while the tops of mountains will be accented by a change of color in accordance with their various heights. The general color will be a warm cream tone.

From the study of the relief model, public service corporations will be greatly aided in locating power lines, roadways, and train tracks along the easiest and most feasible routes across rough country. Further than this, the map is expected to revolutionize the teaching of physical and commercial geography in the schools.

Round the World Migrations

Birds to be marked are caught in traps, as in this photo of chimney swifts. The captured birds are then banded with numbered tags and released to migrate southward.



This map shows some of the courses of bird migration flights. After being banded, these birds were released at the northern points of their course and captured at the southern points.

EVERY spring thousands of birds pass over your head bound on their semi-annual pilgrimage for points south to spend the winter season in warmer climes. But exactly where and how far these feathered gypsies go on their southward exodus, how long it takes them to get there, and how high they fly is still something of a mystery.

This mystery of migration, one of the most baffling of natural enigmas, is, however, slowly being solved. One of the most effective means used in recent years is bird banding. The Bureau of Biological Survey of the Department of Agriculture goes in for census taking on a large and continuous scale, by supervising and aiding banding operations all over the country, and by keeping detailed records. Caught in

Revealed by MARKED Birds

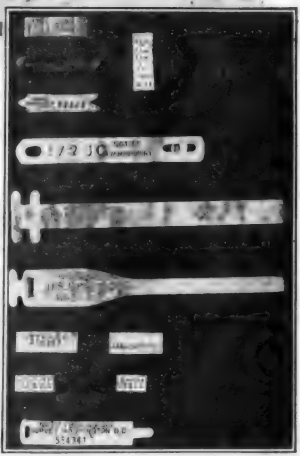
by WALTER E. BURTON

The migratory habits of ducks are well known to sportsmen. The report of a hunter's shotgun has frightened these birds into a hasty take-off.

Where and how far do birds go when they go south? Nobody knows exactly, but the Bureau of Biological Survey in Washington is rapidly finding out by marking these feathered gypsies for observation, as described here.

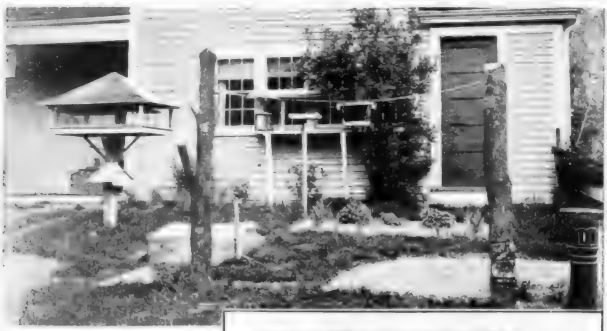
traps, the birds are each given a numbered aluminum band that is clamped about one leg. Thereafter, the wanderings of the tagged bird can be followed by subsequent capture.

From the little that has been learned by these means the arctic tern holds present world records for distance flown. Its nesting place is in the ice fields of the Arctic. After its brood is raised, it travels 11,000 miles south to the Antarctic regions for the winter, and again goes north in the spring —two trips that in a year total nearly the distance around the earth. Robins and tree sparrows spend summer in the Northern United States and Canada, and winter on the Gulf of Mexico. Yellow warblers go as far south as Brazil. The nighthawk that lays its eggs in the Upper Yukon region of



These bands around legs of birds identify them when caught at the southern point of migration.

Alaska is a winter visitor to Argentina. All migratory birds raise their young in the summer season, and spend the winter rest-



Many birds are raised especially for migration experiments. Above is shown a typical aviary fostered by the Department of Agriculture.

This bird has just been captured and is awaiting banding.

ing and hunting food — really enjoying life without the burden of family cares.

Birds migrate both by day and by night. Astronomers peering through telescopes have seen them passing over the face of the moon and sun. Generally, small birds travel at night when they have the protection of darkness, while larger ones proceed in daylight.

The airplane, automobile, stop watch and the theodolite designed to estimate airplane speed all have been used to find out how fast birds travel. Small, perching birds travel as slowly as 20 miles per hour, while geese and ducks approach the mile-a-minute clip. Swifts have been found to live up to their name by traveling normally at about 70 miles an hour, with an occasional spurt up to a higher mark. In India, the timing of two species of swifts revealed that they can travel at 200 miles per hour.

Why do birds migrate? This question has been puzzling bird students for hundreds of years, and is not yet answered. All kinds of theories have been put forward. Some list shifting food supply as the cause. Others maintain that birds originally were native of the South, but spread north in the struggle for existence, and return periodically to their homeland as a matter of inherited habit.

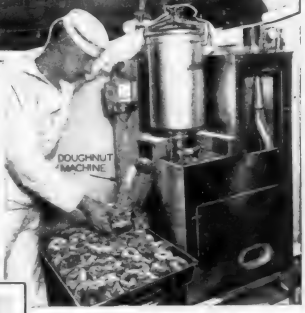
Still another theory states that, in ancient times when ice barriers covered northern portions of the hemispheres, so many birds were produced in one locality that they had to wander far off in search of food, and naturally traveled north as the ice receded. But when cold periods came, they returned south. This happened so frequently that the movement became habitual. But, even though these and other theories seem satisfactory, a perfect explanation of the mystery still remains to be made.

Perhaps you can do your bit to help the birds reveal their age-old secrets. If you are an aviator and want some excitement, you might make some observations on altitude and speed of flight. Or, if you are an amateur astronomer, you may chance to observe birds traveling across the sun or moon, and learn something of their altitude.

Feeding Gobs on U. S. Men o'War

A soda fountain dispenses refreshments to thirsty gobs.

PRESENT day gobs who go down to the sea in modern battle wagons do not want for any of the conveniences of life ashore—they have every comfort and accommodation that the lubber on land has, from a soda fountain dispensing ice cream sodas and a mammoth bakery turning out thousands of sinkers a day to a talkie theater with programs twice a week featuring Clara Bow and Karl Dane. In fact, that enormous mass of metal you see ploughing through the water in the shape of a dreadnaught is a veritable floating city.



Machine turns out thousands of sinkers daily.

Each first line battleship carries a crew of between 1800 and 2300 gobs—and when gobs eat, they eat. This photo shows a few of the thousands of loaves baked each day in the ship's mammoth bakery.

A modern battleship has to be equipped to care for the physical, spiritual, and mental welfare of its crew of between 1500 and 2300 gobs for the long periods during which the ship is cut off from land. With an appetite whetted by hard work and stiff bracing sea breezes, a gob goes into the mess room ready to eat like a famished wolf. Mammoth bakeries, butcher shops, and a gang of gobs doing a stretch of K.P. comprise the kitchen crew.

PLANE TALK

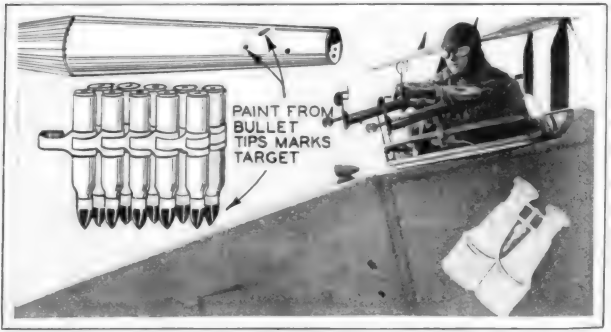
Edited by
MAJOR H. H. ARNOLD

Major Arnold, editor of this popular monthly department, is a pioneer figure in aviation. He was present as an Army observer at the first demonstration of the Wright brothers' plane for the government and is one of the oldest pilots in the game. During the World war he was assistant chief of the Army Air Service.

Paint-Dipped Bullet Tips Identify Themselves on Targets

IN AIRPLANE machine-gun target practice it is frequently necessary to have some means of identifying bullets that have scored hits in order to give proper credit for marksmanship when two or more gunners are firing at the same wind-sock target in tow behind a plane. Recent experiments have shown that if the nose of a bullet is dipped in paint, a trace of the color is left on the cloth of the sleeve target when the bullet goes through. The first surface of the target struck is the one on which the bullet deposits its paint. Thus, on a round sleeve target, it is easily possible to tell from what direction a bullet has been fired.

Blue, green, red, yellow, and black are the colors most satisfactory for the purpose. Bullets are usually assembled in disintegrating belts and dipped in the paint in quantities of fifty at a time.



Machine gun mounted in army plane. Inset shows how painted bullets leave marks on target.

Motorcycle Cops Fly 150 Miles to Patrol Air Maneuvers

These motorcycle patrolmen were transported by plane to guard crowds at air maneuvers.

DURING the maneuvers recently held on the West coast by the Army Air Corps, special police protection had to be provided to keep the crowds of spectators, 20,000 strong, from swarming too close to the whirling propellers of a mile-long line of planes. Ten motorcycle patrolmen and one inspector were furnished at Sacramento and did excellent work in keeping the crowd out of danger—in fact, performed the job so well that it was decided to have them do the same job at San Francisco.

But San Francisco is a distance of 140 miles from Sacramento, and if the patrolmen had to ride their motorcycles that distance, the air show would be all over by the time they got there, so the problem was solved by transporting the officers and their motorcycles in army Fokker and Ford transport planes. The motorcycles weighed about 500 pounds apiece and thus four machines, a total of 2000 pounds, was the maximum that could be loaded in one plane.

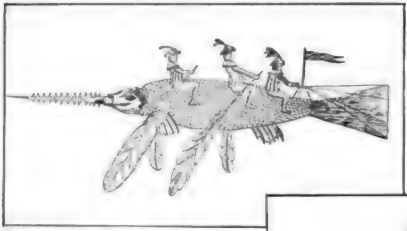
After patrolling the Sacramento field during the take-off of all the army planes except the transport ships, the officers rode their motorcycles into the planes waiting for them, donned their flying togs, and in fifty minutes had arrived at the San Francisco field to patrol the maneuvers there. The air line distance separating the two cities is 90 miles as compared to 140 on the highways.

Loading one of the motorcycles into the transport plane.

New Air Speed Indicator

THE new type air speed indicator shown in the photo below is designed to be mounted on any surface of an airplane exposed to the wind flow and within the pilot's range of vision. The principle of its operation is simple. The flat wind plate is moved pendulum-like over the quadrant gauged in miles per hour, a resistance spring at its pivot end being calibrated carefully to make the readings accurate.

Freak Airships of the Ancients Reputed to Have Flown



This sketch shows an airship devised in 1609 which, according to old records, actually made a flight of one mile. It was a fish-shaped balloon probably inflated with hydrogen or hot air.

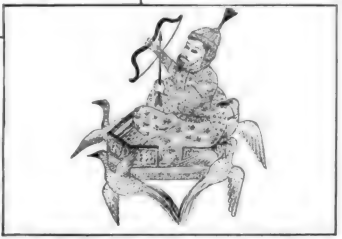
RECORDS of almost every ancient tribe will show among its traditions the legend of some member who achieved the miracle of flight, either through the use of wings or other devices more closely resembling modern airplanes. And the extraordinary part of it is that there are one or two instances, apparently well authenticated, which record flights that were actually successful.

Leonardo da Vinci's glider, designed in 1490, very possibly would have flown successfully, equipped with some source of power other than the human legs which were supposed to keep it moving through the air. Da Vinci was the originator of the parachute and his conception of that device, while not so efficient as the modern 'chutes, undoubtedly would have operated successfully.

In 1609 Pierre de Larrannes drew a picture of a flying fish airship of his own invention, reproduced in the sketch above. His intention was to derive propelling force from two men who sat atop the fish and moved it forward by long, sweeping strokes with feather-tipped oars. A third man near the fish's tail was to act as helmsman, steering by means of a wheel which turned the rudder to right or left.

Tradition has it that seven years later, on March 10, 1616, a craft modeled after that of de Larrannes actually flew. Joseph Patinho and three companions were credited with having taken it aloft at Plazentia, Spain, and flown a distance of one mile to Coria. The story even goes into details of the landing in which Patinho and his companions were thrown off the contraption when it turned over.

Information is lacking as to whether the craft was made buoyant with heated air or hydrogen. It is possible that the invention of the balloon should be credited to de Larrannes. Most certainly there are sufficient details available to authenticate a flight of some character. The craft may have drifted down wind for a mile, but there seems to be little doubt that it actually flew.



Persian Flying Car, from drawing dated 1609. This is typical of fanciful medieval conceptions of airships in which birds were employed to furnish power.

Another ancient airship—which, however, made no flights—was the Persian flying car shown above, supported and propelled by four birds, one at each corner. The sketch is taken from a miniature and shows a Persian sportsman going hunting, back in 1600. He sits cross-legged on a cushion and leisurely fits an arrow to his bow as he descries flying game in the distance. Naturally this sketch is highly fanciful, but there were many similar ones during the period, testifying to man's age-old yearning to be able to fly. Geese, ducks and similar large birds were usually drafted into the medieval artist's pictorial conception of an airship, which rarely got beyond the stage of a drawing on paper. Needless to say, none of these contraptions ever got into the air, but it was out of such fancies as these that the airplane was finally developed.

This Unusual Air Photo Presents Two Pictures in One

THE photograph at the right might as well be that of the New York sky line, taken at dusk. The skyscrapers stand out distinctly against the bright sky in the background. The tall church spire on the left rises high above the other tall buildings. In the center of the picture is a water tank perched above the roof of another tall building. All of the buildings have an indistinct outline due to the dim light.

By giving the picture a quarter turn to the left, the true photograph is seen, that of the Golden Gate, San Francisco, with the sun sinking into the Pacific. The shore line of the city is distinctly outlined by the water. The building spires take on their true semblance of points of land and wharves jutting out into the Pacific, and the setting sun colors the water with the glow which has given it the name of Golden Gate. Note the wires of the airplane wings, faintly visible in the picture—the only evidence which serves to show the circumstances under which the unique picture was taken.

Apparently this is a photo of a city skyline at night. Give it a quarter turn to the left and it becomes a picture of the Golden Gate, San Francisco, taken at dusk from an airplane.

Steam Power Seen for Future Airplanes, Giving Reliable Performance

STEAM power plants have many advantages over gasoline engines for airplane use, provided they can deliver the same efficiency in ratio to weight, but thus far the problem of producing a steam engine which will be as light as a gasoline motor delivering equivalent horsepower has stumped engineers.

Steam engines require boilers, pumps, burners, condensers, water tanks, water, and fuel in addition to the engine itself. All these accessories naturally add much weight. Also the pressure in the cylinder of a steam engine is much less than that of an internal combustion motor, requiring, therefore, a larger cylinder to produce the same horsepower. The steam turbine, however, is much more efficient than the ordinary steam engine, and it is in this field that engineers hope to develop a satisfactory airplane engine.

A steam turbine would have several advantages over a gasoline motor, some of which are smoothness, reliability, constant power at high altitudes, and ability to use fuel oil and thus eliminate the fire hazard. However, its many complications are a disadvantage to the steam turbine. Some idea of the difficult task confronting the designer of such a power plant may be gained from the fact that although steam turbines have been in use for years, no one has as yet produced one that even warrants testing in an airplane.

Indeed, it is significant that all attempts to produce an airplane that would fly failed until the development of the gasoline motor provided a light, concentrated source of power. Early unsuccessful ships, such as the Langley airdrome, employed steam power plants which were so heavy that the machines could not get off the ground.

Sports Now Played at Night

Tobogganing at night, as in this illuminated slide at Montreal, is even greater fun than the daytime sport, the darkness outside of the powerful floodlights adding to the gayety.

Under Electric LAMPLIGHT

Hockey under artificial light retains all the speed characteristic of the game. At right is shown one of the six floodlight units used to light a baseball diamond for night playing. Night games enable minor league fans to attend after working hours.

AT Des Moines the other day a baseball game was played entirely by electric illumination. It was not the first time that such a contest had been held at night, but this particular game served as a kind of laboratory experiment to determine whether or not minor baseball leagues will suffer a slow death or will find the incandescent lamp a timely life saver.

Small leagues lately have not been attracting as large crowds to their contests as they would like to have. One reason is that, during the daytime, fans are so occupied with other activities that they cannot attend baseball games—or other sports events, for that matter. When many organizations were visioning a death by inches, illuminating engineers came to the rescue. Their remedy is simple. They merely erect six 90-ft. towers around the baseball field and place large projectors on them, directing the beams on the field and into the air above, so that high flies as well as hot line drives can readily be seen.

Although baseball promises to benefit by light treatments, football has been taking

Playing the Races Put on 24-Hour Basis by Floodlight Illumination

The sport of kings, as exemplified on this Michigan race track, is just as thrilling under artificial light as under sunlight. Note that the grandstands are illuminated by floodlights as well as the track. That's because spectators like to watch themselves as well as the entertainment on the track.

the lead as a night sport. Dozens of lighting installations have been made at high school and college fields all over the country. Out of the numerous games that have been played on these fields, some unexpected facts have emerged.

Night games reduce the number of injuries to team members, J. A. Summers, sports lighting expert for the Edison-National Lamp Works of the General Electric Co., declares. The reason, he explains, is that night air is considerably cooler than that in the daytime during early-season games; and when a player does not become overheated and exhausted, he is not so likely to be injured.

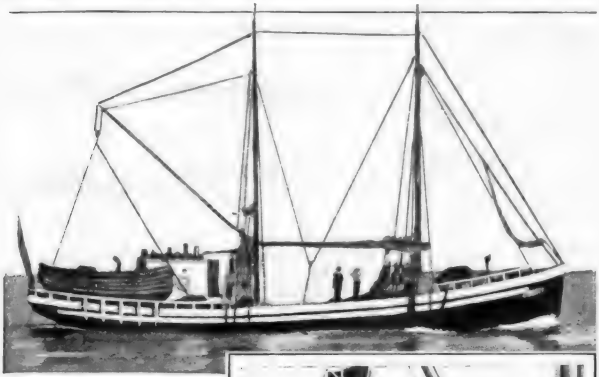
Vanity enters into the designing of a foot-ball lighting system. Half of the average crowd attends a game to watch the plays, while the other half is more interested in the crowd itself. Therefore, the grandstand must be well lighted so that the spectators can see and be seen in order to enjoy the enthusiasm which draws them to the game.

Small fields require about 40 kilowatts of electrical energy. This provides illumination of four foot candles over the playing area—about half the intensity of light in the average office. Systems for larger college fields, consuming 300 or more kilowatts, are being designed. These will provide a field illumination of 50-foot candles. The light is produced by 1000-watt bulbs in powerful projectors. From 40 to 70 or more of these units are required on the average field.

If you own a tennis court, you can double its usefulness by installing an artificial lighting system. The cost is not prohibitive. For a single court, you will need ten 1500-watt lamps strung overhead on cables or poles at the sides of the court. For two or more courts adjoining each other, the relative number of lamps decreases. For two courts, 16 units are needed, and each additional court requires six more. These lamps are placed 30 ft. above the ground between courts.

Horse racing, tobogganing, skating, hockey —in fact, almost every sport has been carried on successfully under artificial light.

Capturing SWORDSMEN of the DEEP



Swordfishing has resisted modernization and is still carried on with topmast schooners, as shown above. All hands jump to action when the prey is sighted by the lookout.

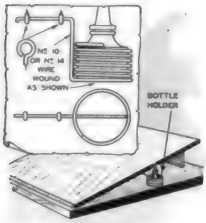
This prize capture weighs well over 700 pounds, and will bring about $75 delivered at the docks.

Great skill is required of the striker, who stands in the pulpit, a platform projecting from the bowsprit, and harpoons the giant swordfish.

THE daring swordfishers who go forth from Atlantic ports in quest of the most dangerous fighting fish known to man, the swordfish, experience more thrills than any of the men who "go down to the sea in ships." All the way from Cape Cod northward to Newfoundland, the fishing fleet is busy in midsummer, capturing hundreds of tons of swordfish, which are known as "beef of the sea." Many of these fish weigh well over 700 pounds.

HANDIKINKS

Try out a few of these practical, money and time-saving suggestions in your home or workshop. You'll find them worthwhile and profitable.

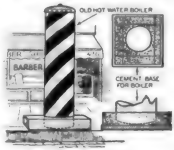


An Ink Bottle Holder for the Drawing Board

THIS ink bottle holder for attachment to the drawing board possesses a number of advantages over the stationary type which can be used on a flat surface. It is always handy and close to the work, and should the holder become jarred or struck the ink is not so likely to splash out of the bottle. No. 10 or 12 gauge iron wire is used in constructing the holder, which can be wound by hand. The beginning of the first turn at the top of the holder is bent slightly toward the center, so that when the bottle is pushed down into the holder it will spring back and prevent its falling out.—August Jeffers.

Barber's Pole Made From Old Water Heater

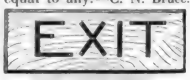
AN OLD hot water boiler can be converted into an attractive barber pole for the front of the shop. Construction of a base to hold the tank substantially in place is first necessary. Make a wooden form of half-inch boards in the shape of a flat, shallow box, large enough to allow the boiler to sit in the center with about six inches of space to spare on each side. The boiler is then set in place and cement poured in. After it has hardened the wooden form is removed and the boiler painted.—Ray Champion.



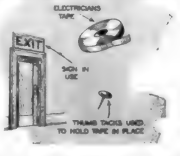
Light Bulb Can Be Converted Into Vapor Lamp

ELECTRIC bulbs with carbon filaments, which develop a high degree of heat, make excellent lamps for vaporizing medicants, deodorants, perfumes or oils. With an alcohol torch warm the bulb slightly over its entire surface, to prevent cracking. Then direct the flame on top of the lamp and heat it until the vacuum draws the glass inward, removing the flame before a hole is drawn. Work the glass into a little cup to hold the substance to be vaporized. Screw the lamp into a concealed base receptacle with about six feet of cord, and you have an electric vapor lamp equal to any.—C. N. Bruce.

Signs Made From Tape

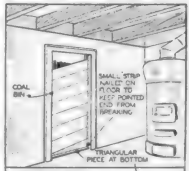


AN INGENIOUS substitute for a painted sign for such purposes as marking exits from buildings can be made from friction tape of the type commonly employed by electricians in insulating wired connections. The tape can be cut into the desired letters with ordinary scissors, and the adhesive surface will secure it in place. Thumb tacks should be placed at the end points of the letters to insure a permanent mounting, and the entire sign covered with a coat of varnish. When carefully done, a sign executed in this fashion is as attractive as any.—Theodore Allen.

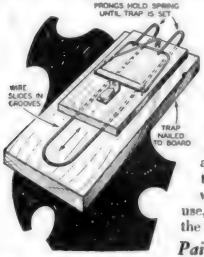


Handy Helps for the Home

Bin Boards Cut at Angle Make Removal Easy



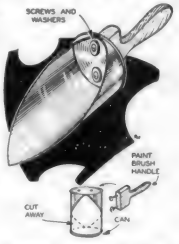
THE coal bin door shown in the drawing at the right is an extremely handy one. Ends of the boards, sliding in the groove, are cut at a slight angle as shown so that the door is made up of boards placed, so to speak, on the bias. To remove a board after the level of the coal pile has been lowered, it is only necessary to lift the high end about three inches to free it from the grooves. The bottom board is made by cutting an ordinary bin board diagonally. A strip should be nailed next to this on the bottom for protection.—Champ Cordelair.



Setting a Mouse Trap

PINCHED fingers caused by premature "explosions" of mouse traps being set can be done away with by a simple safety catch which holds the spring down securely until the trap is baited. Take a piece of stout wire and bend it double, then twist over the two ends into a hook shape as shown in the drawing at the left. Cut two grooves along the bottom of the trap for the wire to slip through; then nail the trap to a piece of wood as shown, and it is ready for use, the hooked ends holding down the bale safely.—Frank Moore.

Paint Brush Scoop Handle

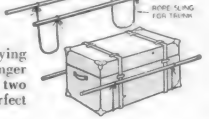


THE handle of a paint brush and a clean tin can combine to make an excellent household scoop, as shown in the drawing at the right. The paint brush handle is sawed off just above the bristles and the tin can cut diagonally, as indicated by dotted lines in the drawing, giving the scoop a sharp nose. The handle is then attached to the base of the scoop with two screws, under the heads of which washers are placed. The handle should be varnished.—Katherine Fitzgerald.

Cleaning Car Upholstery

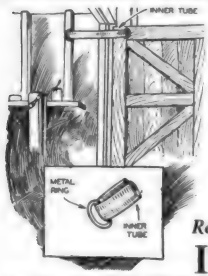
IF YOU haven't had the foresight to pick out a dog to match the upholstery of your car, or vice versa, you're going to spend a good part of your life coaxing the hairs off the cushions. They don't yield readily to a vacuum cleaner, and when dry brushed have a habit of hopping from tuft to tuft. But that doesn't get rid of them. Try a damp whisk broom. Simply dip it in water and shake it out well.—Hi Sibley.

Handy Trunk Sling



IN BUILDINGS where no elevator has been installed for carrying trunks, chests, etc., upstairs, the simple sling illustrated at the right will simplify the job of carrying a trunk up a flight of stairs. Two stout sticks, sufficiently longer than the trunk to afford hand holds, are tied together with two lengths of rope as shown. The sling keeps the trunk in perfect balance.—Lester P. Young.

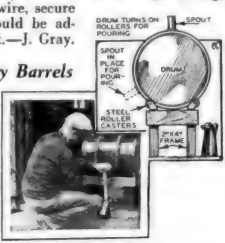
Ideas for the Workshop



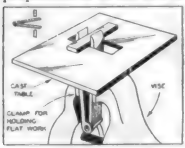
Inner Tube Serves as Workshop Door Closer

KEEPING the door to the workshop closed prevents sawdust from flying into other parts of the building and confines the noise of sawing and hammering to the shop proper. In order to keep the door constantly closed, some sort of automatic device is necessary, owing to the human habit of forgetfulness and carelessness. An old inner tube mounted at the door top as shown in the drawing at the left will do the job nicely. Metal rings, or rings made by twisting stout wire, secure the tube. The tube should be adjusted with a little slack.—J. Gray.

Roller Stand for Heavy Barrels



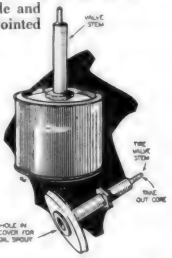
IN HANDLING heavy barrels containing oil, gasoline, etc., the building of a small roller stand as shown at the right will make it much easier to draw out the contents of the barrel. Four roller casters are screwed onto the stand, bottom side up. The barrel is then placed on the casters, making it easy to move to any desired position. The casters should be roughly proportionate to the size of the barrel.—J. B. Roswick.



Attachment for Vise Holds Flat Work Securely

SHOWN in the drawing at the left is a handy device for holding flat work in the vise, as when such pieces as flat sheet, brass shims, etc., have to be held for filing and chipping. Face off a cast iron table and insert through it the tongs of a jointed blunt pin vise.—T. S. Asgaard.

Spare Oil Can Easily Made With Tire Valve Stem

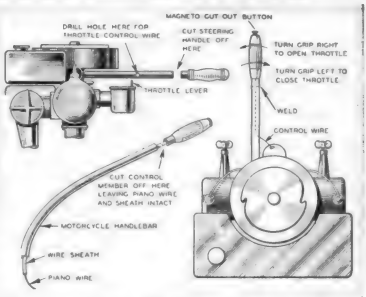


OIL cans have an unhandy habit of being banged about in the shop with such damage to them that they are rendered hors du combat with annoying frequency. If you have an old inner tube lying about, remove the valve stem from it and procure a tin can with a flexible "snap" bottom. Punch a hole in the can lid, screw the valve stem into place as shown in the drawing at the right, and you have an oil can that works just as well as the ready-made variety.—Rafael Grinnel.

Bevel Gear Useful as Nail-Straightening Jig

IT IS often necessary to straighten bent nails for re-use, but the ordinary method of holding the nail with the fingers while pounding it flat with a hammer is tedious and not entirely satisfactory. Get a small bevel gear from an auto junk yard, of the type shown in the photo at the left. Lay the nail to be straightened between the gear teeth as shown.—F. W. Bentley, Jr.

Motorcycle Control for Outboard Motor



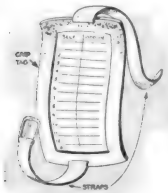
DESIGNERS of outboard motors could take a few lessons from motorcycle engineers in equipping their product with a combination steering and throttle control system. The method by which motorcycles are steered through handlebars which at the same time control the engine speed is one well worthy of adoption by users of outboard motors. As shown in the drawings at the right, the task of fitting your motor with motorcycle grip control is not a difficult one, requiring only the ordinary tools which are part of the equipment of the average home workshop.

First you must secure a motorcycle handlebar from an automobile graveyard, or from some discarded machine you know about. Then, as illustrated, cut the control member from the handlebar by sawing it near the base of the grip. Be sure to cut only the outer casing of the handlebar, leaving the piano wire and its sheath intact. Now cut off the steering handle of the outboard at the approximate spot shown. Drill a hole through the center of the handle and out one side through which the control wire can be threaded. Any small metal cutting bit can be used, or a machine shop will do the job for you at a nominal cost.

Next comes the task of inserting the wire through the drilled hole, connecting it with the throttle lever, and welding the grip in place. The welding is not a difficult task, but if you do not have the proper equipment it will be cheaper to have this done by a professional.

You will find the simplified control a great improvement.—John Edwin Hogg.

Suitcase Tag Makes Score Card for Golfers

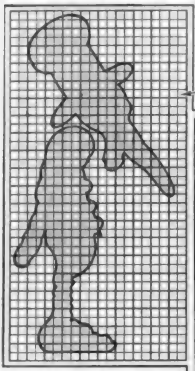


THE necessity of searching through one's clothes for a score card in a round of golf can be eliminated through use of the simple card shown at the left, which is easily fashioned from a suitcase tag. A leather strap for securing the card around the wrist can be cut from an old piece lying around the house, or purchased for a few cents at a shoe shop. The straps are sewed so that the card fits over the wrist like a watch.—Howard Hall.

Sportsman's Game Carrier Ideal for Hunters

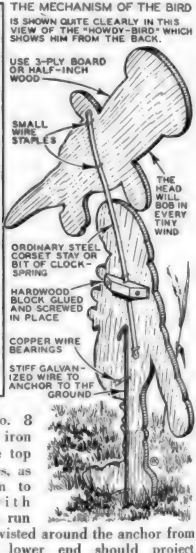
A SPORTSMAN'S game carrier recently put on the market is claimed to be the most complete device of its kind ever devised. As illustrated at the right, the leather shoulder pad fastens with buckles, while the game carriers, constructed of spring wire, are attached thereto. The back of the carrier is a duplication of the front. A recoil pad on the right shoulder absorbs the shock of the discharging gun.—A. Robert Simmons.

"Howdy Bird" for the Garden



Outlining the design of the Howdy Bird is easy by following the squared pattern above. When shaped, paint the bird in bright color after the fashion shown at the right. Details of how the parts are assembled to keep head nodding in the breeze are shown at extreme right.

The "Howdy Bird," nodding his head in the slightest breeze, makes an attractive addition to the lawn or garden and helps to keep marauding birds away.



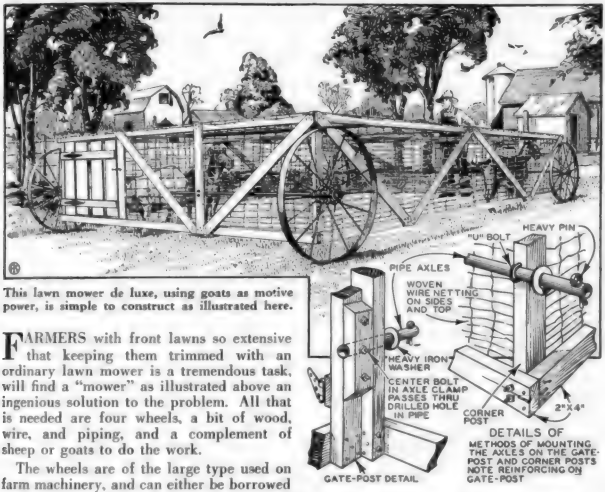
THIS "Howdy Bird," made from two pieces of wood, a clock spring or corset stay, and some bright paint, makes a lifelike addition for the garden lawn which is sure to attract favorable attention. The Howdy Bird's specialty is nodding, which explains where he derives his name. The slightest breeze starts his head to teetering.

Two pieces of material, either three-ply wood or ½-inch thick stock, will be required. Lay out the bird as shown in the squared diagram above, in which each square is ½ inch. After tracing on the wood, cut the pieces out with a coping or jig saw. Next comes the job of assembly, clearly shown by the detail drawings of the back of the bird. Two small staples hold the top of the clock spring or corset stay to the back of the head, two more hold the bottom of the spring to the body, while a wooden piece is screwed and glued in place as shown to add rigidity.

For a ground anchor, bend a 16-inch length of No. 8 galvanized iron wire with the top at right angles, as shown. Fasten to the body with copper wire run through and twisted around the anchor from behind. The lower end should project downward at least five inches, enabling the bird to be set into the ground wherever wanted.

The bird can be finished in two ways, the quickest of which is ordinary painting or lacquering in bright colors. A more attractive way is to glue white cloth over the entire surface of the bird, applying colored bits of fabric to complete the design. For instance, the coat tail, hat brim and band can be red, the buttons, chin, and shoe trim green, and the miscellaneous dots and splotches any other colors that strike your fancy.—Dale R. Van Horn.

A Goat-Power Lawn Mower



This lawn mower de luxe, using goats as motive power, is simple to construct as illustrated here.

FARMERS with front lawns so extensive that keeping them trimmed with an ordinary lawn mower is a tremendous task, will find a "mower" as illustrated above an ingenious solution to the problem. All that is needed are four wheels, a bit of wood, wire, and piping, and a complement of sheep or goats to do the work.

The wheels are of the large type used on farm machinery, and can either be borrowed from equipment not in use, or obtained from junked machines. In case you find it difficult to obtain such wheels, smaller ones can be used if the axle is dropped sufficiently far down the frame to afford the necessary clearance.

Two by fours are used for the frame, which can be built to whatever size is most convenient to your particular lawn, varying also with the number of sheep it is to contain and the frequency with which the device must be moved. If the frame is braced as illustrated it will be sturdy and rigid. Details of the corner posts and gate post, the points most likely to cause trouble, are clearly shown in separate drawings. Two bolts, in addition to nails, support the base of the uprights as shown.

The axles for the wheels are made of cast iron pipe which, except in the case of the gate wheel, is securely attached to two uprights for solidity. The gate wheel axle, being necessarily shorter, is fitted with a wooden axle clamp fitted as shown in the drawing, with one bolt running through upright, axle, and clamp, and two other bolts holding the clamp in place. The gate itself is made large enough to admit the sheep easily, and is hung with two hinges.

In mounting the wheels, insert a heavy iron washer over the axle to prevent the wheel from coming in contact with the frame. Smear a liberal coating of axle grease over the pipe and put the wheel in place, securing it with a heavy cotter pin inserted through holes bored in the end of the pipe. In choosing the height at which to mount the axle, figure on leaving three or four inches clearance between the ground and the bottom of the frame—more, if the ground is unusually hilly. Woven wire netting is fastened to the sides and top of the frame to keep the sheep inside the pen.

The mower is easily moved from one spot of the lawn to another, and you will be gratifyingly surprised at the efficient job done by the sheep.

Tricks of SHORT Change

by KENNETH MURRAY

You will be less likely to lose money to the short change artist after you have read Mr. Murray's interesting expose of the methods employed by crooks.

Carnival barkers like the one above are no longer the most dangerous short-change artists. At right is the "snapper," with elastic cord which snaps bill up sleeve.

ARE the con men, the shills and the short-change artists of the old time circus and carnival deserting the field for the more generous one of big business? The present-day short-change artist is entirely modernized with up-to-date methods. Methods have to be up-to-date to make it possible to short-change an experienced bank teller, and that is exactly what they are doing. As a side line to thus robbing banks, odd fives and tens are daily picked up in drug stores, filling stations, etc. Usually the storekeeper first finds it out when counting up at night; the short-change artist is clever!

Recently a middle-aged man walked up to the teller's window in a small mid-western bank and asked to be given a fifty dollar bill in exchange for bills of smaller denomination. The teller accepted the stack of small bills and gave the man a fifty. On counting the bills, however, the teller discovered and called to the man's attention the fact that there were ninety-nine dollars; forty-nine in small bills, and a fifty.

The stranger thanked the teller and found a one dollar bill, asking that the pile then be changed for a hundred dollar bill. This the teller did, and the stranger walked away. Immediately another man started talking to the teller, asking change for a ten and directions for reaching a nearby town.

Then the teller "came to." The bank had been bunked out of fifty dollars, as the first fifty given the stranger had not been returned. The second man had been the "cover-up" to keep the

The first customer, getting change from the teller, confuses him by shoving a mass of small bills under the wicket. When the rattled teller gives the customer more than is coming to him, the trickster's accomplice covers his getaway.

ARTISTS

teller's mind off the transaction and to give the first a chance to get away.

Organized short-changing of filling station attendants is becoming common and it is evident that there are a great many artists engaged in this branch of the business. The tricks are many and varied. One favorite is to offer a twenty in payment of a bill. On getting the change, the stranger will count it over and discover that five or ten dollars are missing. The method is to fold over the five or ten and hold it between two fingers underneath another large bill in one hand, while asking the station attendant to count the change in the other hand. This trick has been the means of cheating a great many oil station men. The loss is seldom discovered until check-up time at night.

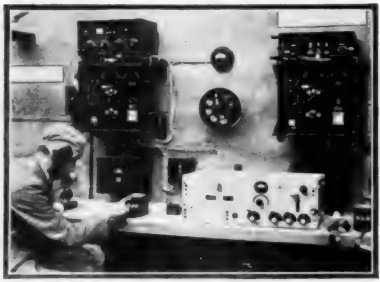
Filling station attendants are favorite game of the short-change men, who usually work by concealing a bill and claiming not to have received the right change. Concealing one bill underneath another, as shown in circle, is a common trick.

Here is the way the light-fingered short-changer conceals a bill on the back of the hand, out of view of the attendant, apparently making his change short the amount of the concealed bill.

Another method of making change appear "short" a bill of any denomination is the use of a clever sleeve attachment. It is merely an elastic running up the coat sleeve; at the end is a spring paper-fastener. The con man merely sends one bill from his change up his sleeve, and the dealer can, of course, see no method of accounting for the loss excepting the most obvious one, that he has made a mistake!

Store clerks, because they handle numbers of bills daily, become careless and are easily deceived by the following trick. The customer shows a twenty dollar bill in paying for a purchase. This he apparently gives to the clerk after making sure that the clerk notices the denomination. In reality a smaller bill, concealed underneath the twenty, changes hands and the clerk gives change for twenty dollars when he has received only a one or a five spot. The clerk usually does not discover his loss until the cash register shows him to be short when the time comes for checking up the day's receipts at night.

SPARKS from the RADIO EDITOR



Edited by
L. B. ROBBINS

Radio is becoming an increasingly important factor in our everyday lives. Modern Mechanics radio fans are offered this month plans for extending the range of uses to which radio can be put, for purposes both of entertainment and instruction. Editors of this magazine are always glad to be of service to readers.

This Remote Control Panel Brings Music to Any Room

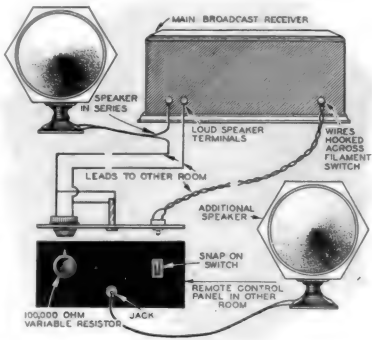
IF YOU would like to have broadcast programs available in the dining room or bedroom, as well as the sitting room, where your receiver is located, you will find this remote control circuit just the thing for listening in while having dinner or while awaiting the arrival of Morpheus.

Two pairs of wires are run between the receiver, which must be battery-operated, and the remote control panel, as shown in the diagram at the right. Lamp cord may be used for this purpose, but if the distance is greater than 30 feet, No. 14 wire should be used.

The remote control panel is made of hard rubber, about 3x6 inches. The switch, phone jacks, and resistor are mounted on this panel, using the circuit shown. The panel is then fastened to the wall at a convenient point by means of wood cleats.

When the installation is completed, the receiver can be turned on and off from the remote control point by means of the snap-on switch, which is hooked across the filament switch of the receiver. The volume delivered by the speaker at the remote control point is controlled by the 100,000 variable resistor.

It will be necessary, when putting the remote control into operation, to turn up the receiver volume control to the point of maximum volume desired. Of course, the receiver must be tuned on the program desired. With this system you can enjoy programs without running frequently to the receiver.



Leads from receiver to remote control panel are run as shown. Volume and power is controlled by resistor and snap-on switch.

Good Antennas Can be Strung From These Rugged Masts

THE antenna of most radio enthusiasts, being simply a wire strung between the house gable and a flimsy pole on the garage, is very unsightly and inefficient. With a little elbow grease and a few pieces of common stock you can easily erect one that is sturdy and of workmanlike appearance.

A neat little skeleton mast is shown in Fig. 1, at the left. Two 16 ft. lengths of three-inch firring are bolted together at the end with a third piece between them as shown. The lower ends of the pair are then pivot bolted to two posts set in the ground. It is held upright by two backstays, the antennas being tied permanently to the mast tip.

Fig. 1 also shows a simple see-saw mast. To the top of a piece of solid timber extending 10 ft. above the ground is pivot bolted an 18 ft. length of 2"x3" timber. It is hoisted with the pull rope as shown.

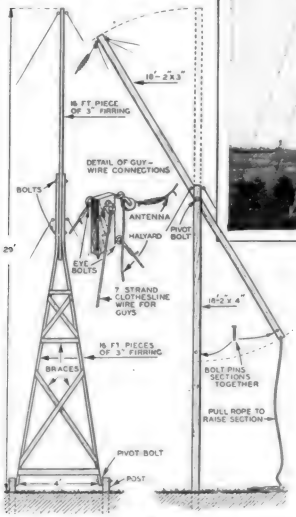


Fig. 1. Masts are assembled and erected as shown above. In bad weather they should be braced with wire guys as shown in the photo.

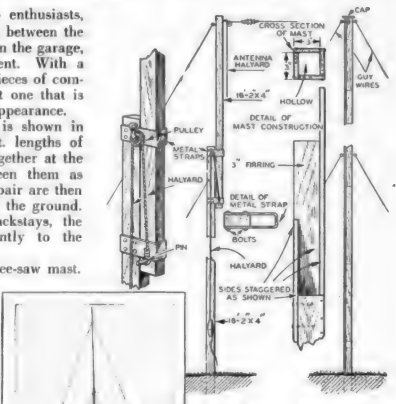
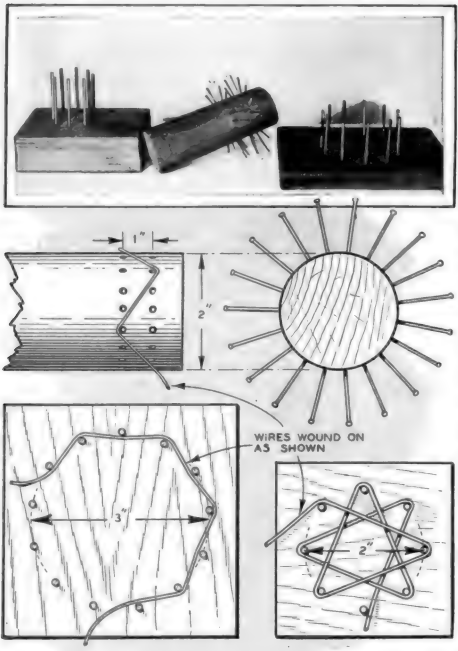


Fig. 2. Mast at left above can be lowered with halyard in case of storm. Rugged box mast at right can be built to any height.

In Fig. 2, at the left, is shown a telescope mast, made of two 20-ft. 2x4s. At the ends are bolted two steel straps of a size that will permit the 2x4s to slide through. The hoisting halyard is a strong rope or twisted wire running through the pulley and fastened to the stop pin. Three wires at top and three in middle are needed as guys.

The best mast of the lot is shown in the same figure, at the right. It is of box construction and can stand a great strain. The sides are clear 16 foot lengths of three inch firring which are staggered as shown. The mast is nailed together with long wire nails spaced about four inches apart. You can make the mast any height desired, but if it is over 20 feet it will have to be guyed with three stays in the middle and three at the top. All masts are painted well as protection against the weather, and guyed with seven strand clothes line wire.

Winding Your Own Coils Is Easy Job With These Forms



Forms for the various coils are made by driving the headless nails into the wood pieces. The coils are built up by winding on the required turns.

WHEN the experimenter wants to wind his own basketweave, star shaped or honeycomb coils he is often at a loss just how to make the forms. Any one of the three forms can be easily made as shown in the photograph and drawing above. Just a few wire nails, and some wood are needed.

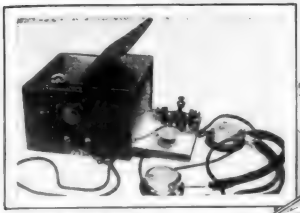
To make a form for a basket weave coil procure a piece of flat wood about four inches square and inscribe on its surface a circle three inches in diameter. After dividing the circle into thirteen parts, drive thirteen nails at the equidistant intervals around it. Finally snip off the heads of the nails and file the ends to smoothness. The required number of turns of wire are wound on in and out between the nails as shown.

Star shaped coils are usually smaller and are used as non-inductive choke coils. For these the circle on the wood should be only two inches in diameter. Eight long pins are driven equidistantly around it in the same manner as before. The star is formed by winding the wire outside one pin and inside the other two, and repeating, as shown.

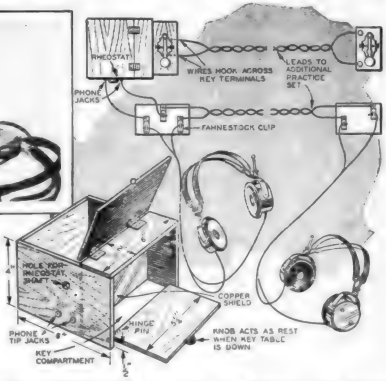
The honeycomb coil is a bit more complicated but a form can be made as follows. Cut off a two-inch cylinder of wood six or eight inches long and sandpaper it smooth. Draw two parallel lines around the cylinder one inch apart as shown in the drawing. Then drill nineteen small holes along each line so that they are equal distances apart and insert long headless nails in each hole, so that they can be removed. The coil is formed by winding the wire end about a pin, then crossing it over to a pin in the other row which is nine holes ahead. Then cross the wire back to a pin in the first row, but nine holes ahead again. Cross and recross the wire in this manner until the required number of turns have been built up.

These sizes, diameters, etc., are not arbitrary, but merely serve as a guide.

This Practice Kit Enables You to Learn the Code Quickly



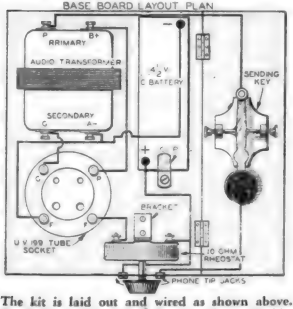
Complete kit has neat appearance.



Above drawing shows plans for case. Extra key and phones can be added as shown, permitting two way talk by students.

THE radio enthusiast who contemplates entering the amateur fraternity must, of course, learn the code to receive and transmit messages. There is no better means of doing this than by constant practice with the code practice set described in this article. The kit can be used to instruct several amateurs as well as one, and with it two way conversation between distant points can be carried on.

The case, made of ¼-inch wood, is built according to the dimensions shown in the drawing. The lid on the top allows one to get at all parts on the baseboard. A feature of this set is the key table, which folds up to become a side of the case. When swung up the key is enclosed in the compartment entirely out of the way. The copper partition does away with body capacity effects.



The kit is laid out and wired as shown above. Flexible leads run to the key on folding table.

The apparatus is assembled and wired as shown in the baseboard layout plan at the bottom of the page. The "C" battery, which acts as both "A" and "B" battery in the oscillatory circuit, is held down to the base at the front end by means of a clip made of stiff spring brass. The wire to the key is flexible lamp cord. This permits the key-table to swing up and down easily.

When the case has been completed and the apparatus wired up, insert an old 199 tube in the socket, and place the phone tips in the jacks. Press the key and you will hear a high pitched whistle in the phones. This whistle is broken up into the dots and dashes with the key. An international code chart should be pasted on the key-table.

If two students want to carry on a two-way conversation for practice in separate rooms, hook on an extra key and pair of phones as shown in drawing at the top of the page. Each operator takes his seat with his phones on his head, his hands at his key. Each will be able to hear the other's sending. Thus questions can be asked and answered by both parties, and excellent code practice obtained.

EXERCISING at EASE with

Above: A pair of "stylish stout" freshmen of the Venice Venus club learning how to reduce their avoirdupois with the electric vibrating machine.

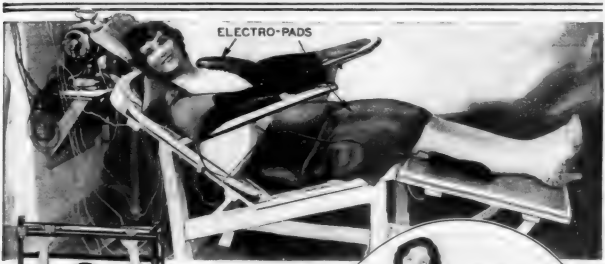
Honor graduates of vibrating machine course.

The vibrating machine at work in the boudoir. Much of the popularity of this machine is due to the fact that it may be set up anywhere.

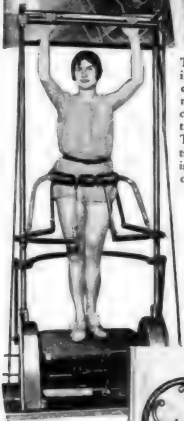
TO OVERWEIGHT men and women who desire to cut down their tonnage the strenuous exercises and rigorous diet prescribed by hard-hearted physicians are usually soon forgotten. The love of rich food and fondness for reclining in an easy chair have more appeal than the thought of a sylph-like figure.

It is for this type of person that ingenious inventors have perfected a great array of mechanical devices which are said to be as efficacious as personally performed exer-

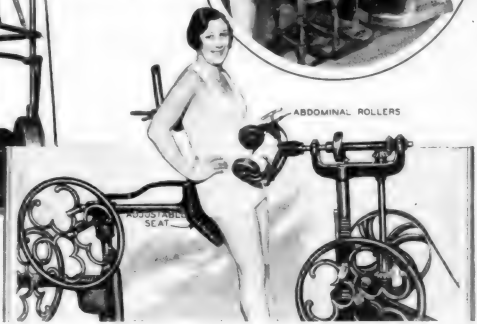
Mechanical Beauty AIDS



The electrolysis chair, illustrated above, reduces surplus flesh by means of an electric current operating through weighted pads. The cannon-like contrivance on the right is really another type of vibrating machine.



Above is the hip-reducing machine, an electrical device which is said to roll away the surplus flesh. It is self adjusting.



This machine massages away surplus flesh from the abdomen.

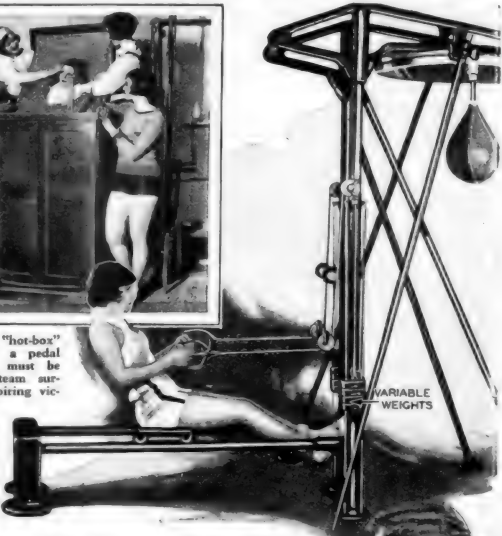
cises for those who would like to take off weight. Whether these devices can entirely take the place of calisthenics and outdoor sports is a question that has yet to be decided.

So great has the synthetic exercise fad spread that in Venice, California, a reducing society known as the Venice Venus Club has been formed and has equipped itself with all of the latest mechanical gymnasium equipment. The club has become popular among movie chorines, who must retain that perfect figure if they would hold their jobs.

It Is Easier to Reduce by Letting Machines do the Tiresome Exercises

Inside of the "hot-box" shown above is a pedal machine which must be worked while steam surrounds the perspiring victim.

At the right is shown the "Gym-Junior," a complete gymnasium, including everything from punching bag to rowing machine.



Below: A rapidly revolving friction drum covered with a leather pad stimulates circulation in cold feet. All the patient has to do is sit in a comfortable chair and let the machine perform her foot exercises for her.

Advertising ODDITIES Attract Attention

THE milk delivery truck illustrated at the right, in addition to attracting attention through its unusual bus-like design, incorporates several distinctive features which make it especially suitable for this type of work.

The floor of the truck is built low and the doors are wide to make frequent entrance and exit easy. The car is driven from a standing position and is designed for frequent starting and stopping. The roomy body is fitted with racks to hold the various sizes of milk bottles.

This truck is designed for driving in a standing position.

An Original Quick Lunch Wagon

Home cooking is suggested by cottage.

THIS very original quick lunch wagon may be seen on the streets of Le Touquet, France, during the summer months. The owner has built it up on an old automobile chassis so that it shall, as far as possible, represent an old style thatched cottage, the idea being, it is presumed, to suggest old fashioned home cooking.

The car disports window boxes filled with growing flowers, leaded pane windows, and a brick chimney, while the body panelling of the car is finished to represent old-fashioned brickwork.

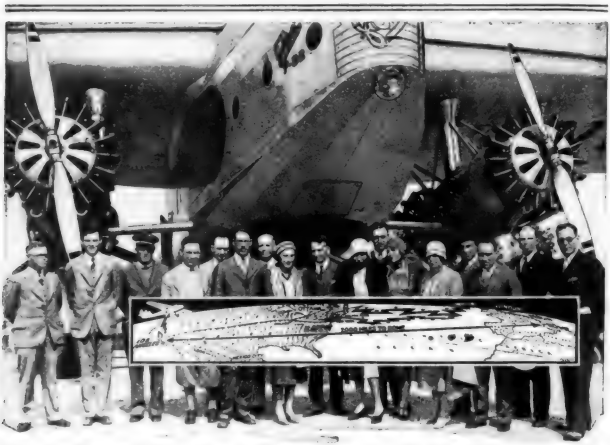
During the summer tourist season the car is driven to strategic points where it offers for sale such delicacies as hamburgers, hot dogs, snails, and the usual French wine.

Cider Jug Suggests Wares

THIS odd looking roadside soft drink parlor is two stories high and serves cider and orange juice to passing motorists. Situated at a bend of the road where it may be seen for some distance, it fairly shrieks its wares at the passers-by with its unique design in the form of a cider jug with an orange perched on top. The walls are painted the color of the old earthen cider jug, the orange is painted in the flaming natural color of that delectable fruit.

Signs are unnecessary on this roadside soft drink stand.

Airplane Passengers Talk 7000 Miles to Europe By Radio



Under the direction of Herbert Hoover, Jr., second figure from the left, radio communication was established between passengers of this Fokker plane flying over California and notables in Europe.

PASSENGERS aboard a speeding Western Air Express flying recently over Southern California talked by radiophone with Mussolini in Rome, with Ambassador Dawes in London, with Herr Milch, Germany's aviation giant, in Berlin, and a score of other notable world figures at various points on the continent of Europe and North and South America.

Under the direction of Herbert Hoover, Jr., the second figure from the left in the photo above, this amazing historic feat marked a tremendous stride in the advance of radio telephony. The success of the test foreshadowed the future possibilities of radio telephony, demonstrating that a conversation between passengers of a high flying plane and their friends located at various points of the globe can be held as easily as between two persons only a block away.

The voice signals were transmitted to land with the radiophone with which the plane was equipped, then relayed cross country to the high powered trans-Atlantic telephone station in New York. Thence the signals were transmitted across the Atlantic, to be intercepted by a receiving station in London. From there the signals were distributed by relay to the points throughout Europe at which the various notables were located.

Replies were made over the same chain of relay stations, thus permitting two-way conversation across approximately 7000 miles of space. The conversation, the schedule for which was previously arranged, was carried on without interruption. Some of the other figures which assisted in making the test were, Dr. A. L. Klein, of the California Institute of Technology, and Pilot George Rice, of the Western Air Express.

Radio Links Liners With Shore

FOUR trans-Atlantic liners, the Leviathan, of the United States lines, the Homeric, the Majestic, and the Olympic of the White Star lines, are now equipped with radio telephone apparatus which permits passengers to talk with friends in either Europe or America.

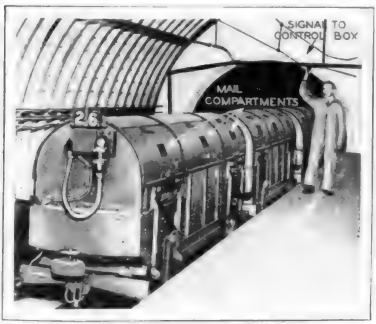
This Novel Device Sizes You Up, Then Prescribes Diet

"HOW much should I eat?" is the question asked by the sign on the top of this unique machine, shown in the photo at the right, which was placed on display in the International Hygiene show recently held in Dresden, Germany. After weighing you and measuring your height, the machine thinks the question over carefully, then delivers for your instruction a card outlining your diet, showing the natures of the food and the number of calories you should eat daily. If you are fat and short or tall and thin the machine will advise you as to what you should eat to keep fit.

After weighing you and measuring your height, this novel machine delivers a card that tells you how many calories you should eat each day.

Subway Trains Carry London Mail

IN ORDER to solve the problem of handling expeditiously the vast quantities of mail that pours into the largest city in the world every day, London postal authorities have constructed a network of underground tunnels for transferring the mail from the central post office to the branch stations in the outlying parts of the town. The sacks of mail are conveyed from one point to another by means of small driverless trains which carry a small daily load of 23,000 bags, at a speed of 25 miles per hour. When the train is loaded, an attendant pulls an overhead cord as shown in the photo below, and the train starts off with its load which is sometimes as much as 300 tons.



Mail to outlying London postoffice branch stations is conveyed through underground tubes on these driverless trains.

Electricity May Cure Deafness

A POSSIBILITY of helping some kinds of deaf people to hear electrically, by feeding suitable electric currents directly into the nervous machinery of the ear without using the ordinary hearing mechanism at all, has been put forward in a paper by an eminent scientist at the University of Vienna.

Since the auricular nerve action is electrical, and since modern vacuum tube apparatus can produce electric currents corresponding exactly to vibrations of sound waves, it ought to be possible, the scientist argues, to pass suitable electric currents into the human ear and thus set up in the auricular nerves impulses that are similar to those which are produced when hearing takes place in the ordinary way.

Preliminary experiments along this line have been successful.

HOME WORKBENCH

Edited by

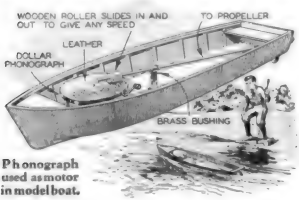
A. NEELY HALL

Home craftsmen with a few simple tools, some nails and glue, and a piece of wood or two will find the workshop projects presented here by Mr. Hall easy of execution. Mr. Hall is author of "Carpentry and Mechanics for Boys," "Outdoor Boy Craftsman," etc.

Cheap Phonograph Makes Novel Motor for Model Boat

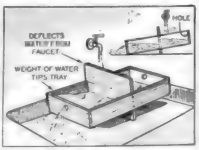
MAKERS of model boats who have been searching for a cheap, variable speed motor for driving some of their larger models will appreciate the phonograph adaptation illustrated in the drawing below. The phonograph is of the cheap dollar type, purchasable at a toy shop or music store, which plays a record about six inches in diameter. You needn't be critical of the reproducing qualities of the phonograph, for the only part you will use is the motor base and disk.

Remove the tone arm and needle and install the phonograph in the hull of the boat as indicated in the drawing. The propeller shaft is run through the bottom and a sliding wooden roller fitted to the end for contact with the felt covered disk of the phonograph. A bearing with a brass bushing is placed near the end of the shaft to keep it firmly in contact with the motor, which works most efficiently if it is mounted at an angle to conform with that of the propeller shaft. A variety of speeds can be obtained from the motor by simply moving the sliding roller in or out on the shaft.



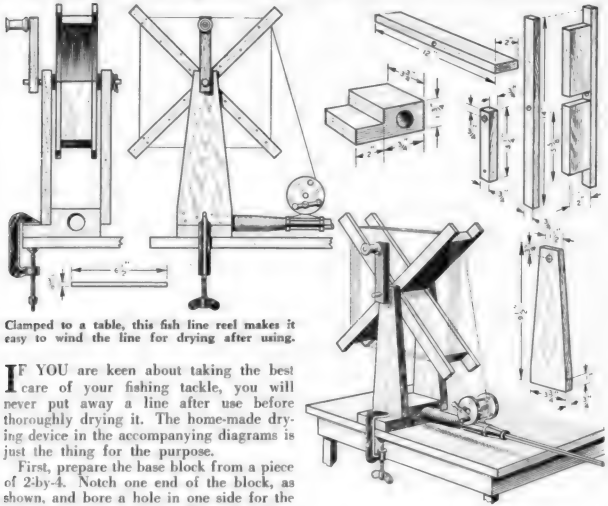
Phonograph used as motor in model boat.

Handy Print-Washing Tray



A TRAY for washing prints which automatically changes the rinsing water at intervals, keeping it always fresh, makes a handy addition to the photographic dark room. Such a tray is easily constructed; the drawing above shows the simplicity of its design. Half inch boards are used, the size of the tray varying according to requirements. The center board, acting as a pivot, projects about three inches from the bottom of the tray and six inches above it, forming a deflector for water from the faucet. Holes bored in the ends of the tray permit the water to flow out when it has reached the top, at which point the deflector, directing the water stream into the other side of the tray, overbalances the end and tips it down when full.

Drying Reel Helps Keep Fish Line in Good Condition



Clamped to a table, this fish line reel makes it easy to wind the line for drying after using.

IF YOU are keen about taking the best care of your fishing tackle, you will never put away a line after use before thoroughly drying it. The home-made drying device in the accompanying diagrams is just the thing for the purpose.

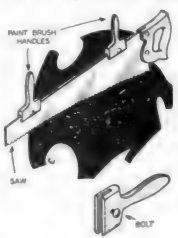
First, prepare the base block from a piece of 2-by-4. Notch one end of the block, as shown, and bore a hole in one side for the end of a fishing-rod handle to slip into. Then, prepare two pieces for the reel supports, and bore a ⅜-inch hole through them near the top, as shown, for the shaft to slip through, and nail the supports to the base block.

Cut two strips for edge strips and two blocks of the size shown, to be fastened between the strips with a ¾-inch space at the center. For the other pair of arms, cut a block 12 inches long and slip it through the space allowed between the blocks of the first arm. Then cut another pair of edge strips, saw each in half, and fit the halves to the edges of the block. Trim off the ends of the strips so that they will project 1 inch beyond the ends of the blocks.

Bore a ⅜-inch hole through the center of the reel for the shaft, and make the shaft of a piece of ⅜-inch dowel-stick. Make a crank, bore a hole near one end for the shaft, and mount a spool at the other end for a knob. Mount the reel upon its support with iron washers slipped over the shaft, between the reel and its supports.

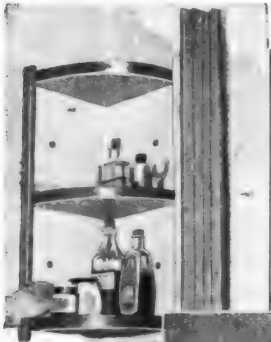
Handles for Saw From Paint Brush

AN ORDINARY carpenter's saw, fitted with handles as shown below, can be impressed into service as a cross-cut saw in an emergency. Two handles from discarded paint brushes, slotted to fit over the saw and bolted in place, afford hand grips for the operators. Handles should be mounted as near the ends of the blade as possible in order not to interfere with the working surfaces. The handles can be removed from the saw by simply loosening the bolts whenever the tool is wanted for its original use.

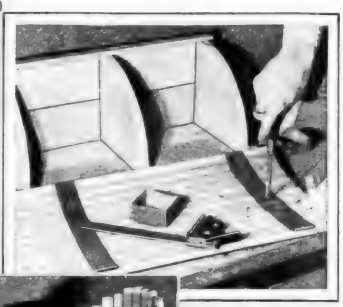


Circular Corner Cupboard Has Unusual Flexible Door

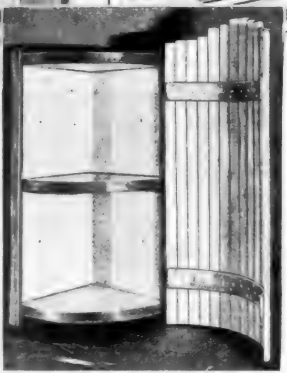
Put vacant corner space to work.



Cupboard mounted in the corner ready for use.



Heavy leather straps hold slats of the door in place.



Completed, door in place, ready for mounting.

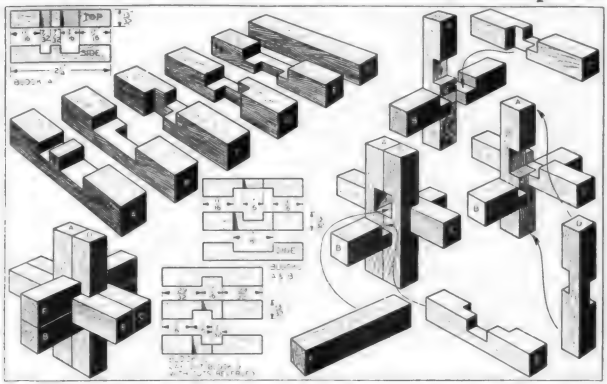
A CORNER cupboard will render excellent service in almost any room of the house. When it is used for holding bottles and other small articles, a door is almost essential. In the cupboard shown, the door is of novel design.

Construction of the cupboard other than the door is conventional. Cut from one-inch stock three pieces—two ends and a middle shelf—in the shape of quadrants whose radius is about 7½ in. Smooth the curved edge of each. The two side pieces of the cupboard are each 18½ in. long and 7½ in. wide. Cut them from ¾ or ½ in. stock, and nail together the parts as shown.

You are now ready for the door. Build this up of parallel strips of wood, each about ¾ in. wide and ⅜ in. thick. Cut the pieces to various lengths, so that the top ends produce a pleasing curve. Nail the two outside strips to the edges of the sides and shelves to provide supports for the hinges and catch. Lay the others side by side, with the bottom ends even, and hold them temporarily in place with weights. Cut two lengths of heavy leather belting, each piece one inch or more wide, and a fraction of an inch shorter than the combined width of the strips. At a distance of about 3 and 16 in. respectively from the lower end of the door, fasten the leather pieces to the wood strips, using ½-in. wood screws, one or two to a strip.

The leather belts provide a firm yet flexible support for the door strips, so that the door will curve around the circular edges of the cupboard shelves. When opened, it folds back flat against the wall. The catch must be of a type that holds the door from moving outward or to the side. An ordinary small hook and eye, or a small brass hasp with a hook to keep it over the staple, are suitable.

Novel Block Puzzle Furnishes Real Test for Sharp Wits



Without recourse to the diagram, you'll find the task of assembling these blocks a real puzzler.

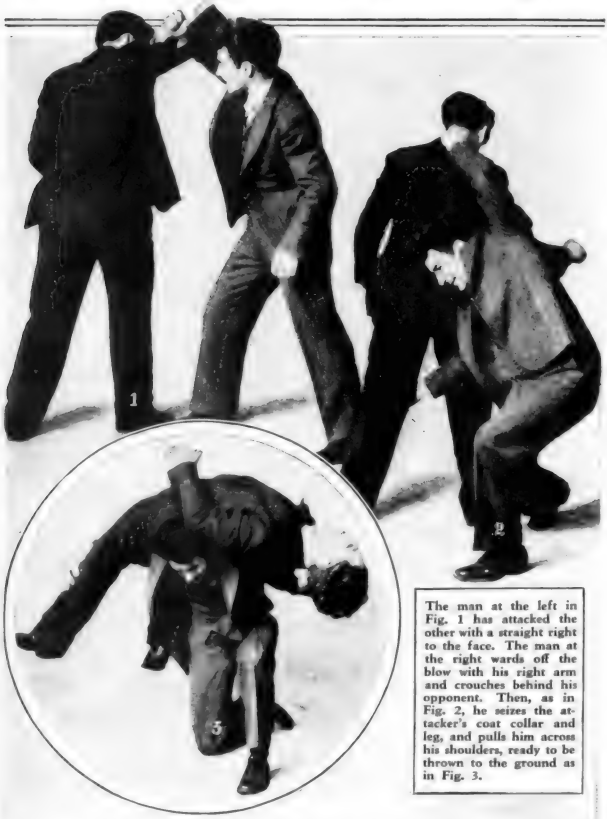
UNLESS you are a wizard at working puzzles, you may be stumped with the assembly of the cross puzzle shown above, even after you have prepared the blocks, and once followed through the steps shown for putting together. For this reason, I advise you to letter one end of each block, as I have lettered them, though not necessarily A, B, C, D, E, F. In fact, this might suggest the solution to friend puzzlers. You might adopt the letters B, L, O, C, K, S, however, in the given order, and remember the key to the solution as the word "blocks." Referring to my diagram letters, for illustration, fix in your mind that in assembling the cross, block B crosses A, and block C crosses both A and B. Then block D parallels A, block E parallels C, and block F slips into the square hole formed by the other pieces, and provides the pin that holds the cross together. Simple enough, with the blocks taken in correct order, and turned the right way, but without the key to the assembly you will probably be as dumb as the other fellow the next time that you tackle the puzzle. Believe it or not, make yourself a set of blocks, and settle the point to your satisfaction.

It is no small trick to prepare a set of blocks that interlock without play in the joints, like the model. But, after all, the blocks require nothing more than accuracy in laying out, and carefulness in cutting to the lines. When you have completed the six pieces, you may find that some of the joints are too snug or too loose. A piece of sandpaper will quickly rectify snugness. But ill-fitting blocks should be replaced by correctly cut blocks.

Basswood is best for the job, but if it is not available any close-grained wood that is easy to cut will do. A try-square and sharp pencil, or jackknife, for marking out the pieces and their joints, a coping saw and sharp chisel for cutting, and No. 00 sandpaper for smoothing surfaces, are all the tools necessary. If a circular saw is at hand, however, it will simplify ripping strips to the required width and thickness, and cutting the strips into blocks. Indeed, with the blade of a circular saw set to cut to the correct depths, it is possible to cut joints, also, with it.

When you have cut the blocks and are satisfied with the job, clean up surfaces with sandpaper, and finish with colored lacquer. Lacquer finishes the blocks without appreciably increasing the thickness, and it has the desirable property of drying rapidly, with a smooth hard surface.

Defend Yourself with JIU



The man at the left in Fig. 1 has attacked the other with a straight right to the face. The man at the right wards off the blow with his right arm and crouches behind his opponent. Then, as in Fig. 2, he seizes the attacker's coat collar and leg, and pulls him across his shoulders, ready to be thrown to the ground as in Fig. 3.

A straight right to the face, the most usual form of attack, can be countered by these jiu jitsu holds.

JITSU Methods

by SAM BROWN

Another effective counter to attack by a straight right to the face. Defense man blocks lead with right forearm, grasps opponent's arm in both hands, and passes right hand under elbow of opponent, giving tremendous leverage.

Using the modified Jiu Jitsu methods described here by Mr. Brown, you will be able to protect yourself in case of an unexpected attack.

TWO hundred years before the Christian era, the unarmed forces of the Japanese emperor completely routed a hostile tribe who were fully armed. That much is history. And since then, down through generations and generations have come the priceless secrets which enabled the unarmed men of Nippon to score their remarkable victory —the secrets of jiu jitsu.

Much of the art is still a secret. The Japanese are especially reticent concerning the dozen or so death-producing grips and blows. Other and less dangerous secrets of jiu jitsu have long ago become public knowledge, especially those maneuvers dealing with the twisting or holding of certain parts of the body. Many of these "muscle-breaking" tricks are well adapted to the layman's use, and should be learned by every man to guard against the inevitable "once-in-a-lifetime" attack of an armed or unarmed person.

Take your average American man—gentleman or thug—and you will find that his instinctive mode of attack is a straight right to the face. And it is very effective. But not against a Jap who has been trained in jiu jitsu; not against any of our state police

Here is a spectacular jiu jitsu attack. Victim is grasped by coat lapels as in 1, after which attacker thrusts foot in opponent's stomach as in 2, and falls as in 3, throwing victim.

who have been taught a modification of the same system. The three photographs on page 132 clearly show the counter used. Here, the man on the left has attempted to deliver a right-hand blow to the face of his opponent. The man on the right has warded off the thrust with his right arm—a familiar boxing counter which is so simple as to be almost instinctive. But, he goes further. Quick as a flash he crouches in back of his foe. He seizes the collar of his opponent's coat with his left hand. He grasps his victim's left leg with his right hand. Then, pulling his opponent forward, he crouches on one knee to bring the original aggressor high across his shoulders, from which position he can be tossed forward, flat on his back, or to either side with equal facility.

The whole maneuver is incredibly effective. I have seen a 100-lb. Jap throw a man twice his weight by this method, in a split second, and with such force as to leave the larger man completely dazed—an easy victim for further punishment.

An even more effective counter, when properly performed, is shown in the two photographs on page 133. The man on defense, after blocking the lead with his right forearm as before, grasps the extended arm of his opponent in both hands, at the same time throwing his right foot quickly over the right leg of his victim. He then bends the attacking forearm sharply back, while stepping behind the attacker. Next he releases his right hand, passes it under the bent elbow of his opponent, and grasps his own left wrist. And there you are! Pressure against the wrist places a severe strain on the victim's arm and shoulder—a strain so delicately placed that only a very small amount of the victor's strength is needed to hold his opponent powerless.

One of the most spectacular of all jiu jitsu attacks is shown in the three photographs at the top of this page. It has been performed scores of times by the dashing Doug Fairbanks in his portrayals of the up-and-at-'em man-killer and heart-breaker.

Grasping his victim's right wrist with his left hand, the attacker in Fig. 1 quickly assumes the position shown in 2, with his right arm around opponent's right leg. From this position the victim can be lifted across the shoulders and thrown hard enough to stun him.

Startling as the maneuver is, it is decidedly simple. As can be seen by the photographs, the movement starts with the attacker grasping the lapels of his victim's coat. The coat is then jerked down over the shoulders, and the attacker then thrusts his left (or right) foot into the pit of his victim's stomach. The next, and startling part of the maneuver, finds the attacker on his back, with the victim juggled on his left foot. Of course, the movement does not stop in mid-air. By no means. You can easily see how the unfortunate victim keeps right on going, stopping only when he lands with one of those dull, sickening thuds on the back of his neck.

Perhaps the best known bit of jiu jitsu is the familiar "come along," extensively used by the police in handling unruly prisoners. It is truly effective, a real arm breaker. The attacker grasps his victim's right hand with his own right hand. He then pulls his prisoner towards him, at the same time hooking his left arm over his opponent's right arm. The final grip uses the attacker's left arm as a fulcrum over which to bend his victim's right arm.

Another bit of police jiu jitsu is the head lock. The attacker grips his opponent by placing one of his hands at the back of the victim's head, the other, under his jaw. A twist of the head will usually subdue the most unruly prisoner. The back of the neck is a central point for many of the body's nerve centers: and the Japanese, in holding a man in this manner, can completely paralyze his muscular system. This is not done in the police method, the twisting of the head being usually more than sufficient.

Still another effective trick used by the police is shown in the three photos on this page. After obtaining the preliminary hold shown in the first photo, the attacker quickly crouches below his opponent's right arm and grasps his right leg, as pictured in the second photograph. From this position, the victim can be lifted high across the shoulders and then thrown forward on the ground with sufficient force to stun him.

The Japanese expert must spend four years of steady, patient practice before he can qualify as a master.

Automatic Griddle Bakes Three Fluffy Flapjacks a Minute

With a thermostat keeping the heat always at proper temperature, it is only necessary to fill the batter tank and remove the finished cakes.

A FLAPJACK griddle that is entirely automatic in action has recently been placed on the market by a Los Angeles firm. Batter for five hundred cakes may be placed in the tank, after which it is only necessary to turn on the switch and carry away the cakes.

Batter is fed to the grid by an automatic process, making the cakes uniform in size. The aluminum griddle, which requires no grease, revolves just fast enough to bake the cakes on one revolution. Half way around, the flapjacks are automatically flipped over, and when the circle is completed they are lifted off and placed on a plate which is held by a rack on the side.

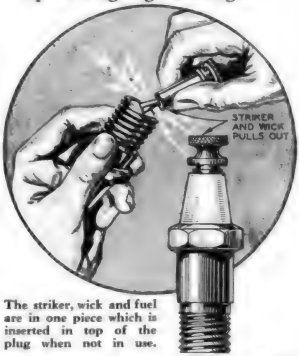
The heat is controlled by a thermostat, thus saving electricity and insuring that the cakes are cooked to the proper turn. The manufacturers even furnish a prepared flour to which it is only necessary to add water to make light, fluffy cakes.

Beam "Mike" for Outdoor Films

REVOLUTIONARY in its scope and perfected to the point where it is believed millions of dollars will be saved in the production of outdoor talking pictures, the beam microphone pictured at the left is being used for the first time in the filming of a railroad epic in Montana. The microphone will pick up sounds only from the point at which it is aimed, thus permitting directors to give oral instructions during filming.

How beam "Mike" is aimed.

Spark Plug Cigarette Lighter



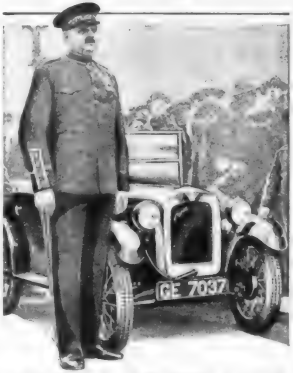
The striker, wick and fuel are in one piece which is inserted in top of the plug when not in use.

THE unique cigarette lighter pictured above is used as an advertising novelty by a prominent auto accessory company. Shaped like a spark plug, the sparker material is imbedded in the base, while the wick, striker, and fuel receptacle are compactly arranged in one piece which is inserted in the top of the plug when not in use. To light, the "binding post" is pulled out and the striker rubbed over the base.

Giant Driver With Bantam Auto Shows Size by Contrast

AS a unique means of advertising their new car, "The Tiddler," English manufacturers displayed one of the autos at the recent Scottish motor show accompanied by a chauffeur of enormous size to give contrast to the smallness of the car.

This car is fast gaining popularity in this country, where it is known as the "Bantam" car. It is remarkable for its comfort, ease of maneuverability, and low running cost.



An idea of the size of this Bantam car can be gained by comparison with giant driver at side.

Road Automat Saves Walk for Gas

LATE hour motorists whose tanks run dry when they are out somewhere several miles from a filling station will find these new gas automats, shown in the photo below, which are being installed around Los Angeles as emergency stations, a great boon.

Placing four-bit piece in slot delivers can of gas.

Future Planes May Be Noiseless

AIRPLANE passengers of the future may travel in planes that are as noiseless as railway passenger cars, it is predicted by Washington aviation engineers who are conducting experiments to eliminate the noises which make it impossible to carry on conversation in a plane.

Two means of eliminating the noises are being tried—reduction of propeller, engine, and exhaust noises, and soundproofing of the cabin. The former means will probably be the chief solution to the problem, as the latter has reached its practical limits.

Novel German Game, "Swing-ball," Develops Agility and Strength

AMONG the fair sex of Germany the new game, called "Swing-ball," is rapidly coming into popularity. The game, played as shown in the photo at the right, develops agility, alertness and strength, and helps to keep that boyish figure and schoolgirl complexion.

The ball, similar to a basket-ball, slides along a rope, each end of which is held by a contestant. The players try to hit each other by swinging the ball around in a circle. Ability to jump, duck and dodge are the chief assets of the defense.

THE AMATEUR ELECTRICIAN

Edited by
THEODORE ALLEN

Electricity is man's most useful and faithful servant. And for experimenters, this mysterious force is a subject of intense fascination. This month Mr. Allen offers plans for making serviceable electrical contrivances and instruments that will teach you the underlying principles of electricity.

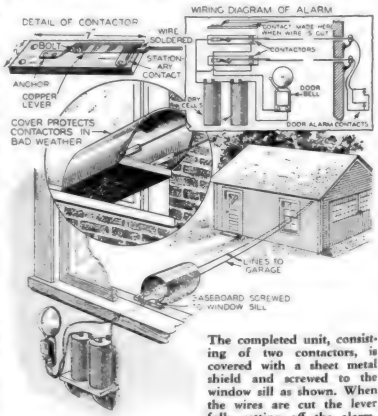
This Burglar Alarm Goes Off When Thief Cuts the Wires

IF a thief, bent upon stealing your car out of your garage, can manage to cut the wires running to the electric burglar alarm, he can usually do the job without getting caught. Here, however, is a burglar alarm that cannot be tampered with, for it will go off when the wires are cut as well as when the door is opened.

The heart of the alarm system is two contactors from which the wires running to the garage insulators are suspended. A copper lever is bolted to a copper anchor strip, which is in turn screwed to a baseboard as shown in the drawing at the right. A stationary copper contact is screwed onto the same baseboard, just beneath the copper lever, as shown. The wires running to the garage are soldered to the copper levers, and the completed unit, covered with a sheet metal shield, is screwed to the window sill.

The contactors should be so placed that the tension of the suspended wires leaves a gap of about ½ inch between the stationary contact and the copper lever, which forms the movable contact. The alarm is wired up as shown in the drawing.

When a thief cuts the wire the tension is released, allowing the movable copper contact to fall, thus making contact and setting off the alarm, and announcing to you that it is time to get out your "gat."

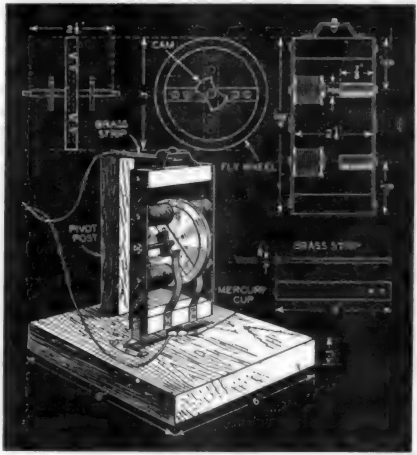


The completed unit, consisting of two contactors, is covered with a sheet metal shield and screwed to the window sill as shown. When the wires are cut the lever falls, setting off the alarm.

Electric Gyroscope Makes Very Interesting Scientific Toy

GYROSCOPES are much used nowadays as stabilizing devices for various machines such as airplanes and ocean liners. A gyroscope is the heart of the so-called Robot pilot for airplanes which exerts practically automatic control over planes in flight. The blueprint at right shows plans for an interesting electrically powered gyroscope which is a fascinating scientific toy, from which the operation of large gyroscopes can be studied.

You will need a few flat pieces of brass and a brass disk three inches in diameter. Essentially, this gyroscope is a hanging frame inside which is an electrically driven flywheel. This frame is hung on a pivot so that the bottom is free to make electric contact in a little bowl of mercury. A dial indicator is attached to one side of the gyro frame which can be used to prove that the earth is rotating on its axis.



The operation of large gyroscopes can be studied from this toy.

The axis of rotation of a gyroscope always remains constant; that is, if pointed toward some star in the sky, which remains in a fixed position, no alteration of the gyroscope's position relative to bodies on the earth takes place. The effect of the whirling disk is to eliminate the effect of gravity, and rotation of the earth on its axis will be shown by the moving dial of this toy gyroscope. Fifteen minutes' operation of the toy will be sufficient for a visual demonstration of this fact.

The frame of the gyroscope is made of sheet steel and the end pieces are of soft iron. Cores for the magnets are installed as shown in the dimensioned blueprint. The coils are wound with four ounces of No. 30 silk covered wire and are coupled in series. Brushes are installed as shown in the blueprint. One contact is grounded to the frame. The other runs to one brush which contacts with the cams for timing the magnetic impulses which go to the steel bars screwed against the brass disk to give the right magnetic flux.

A wooden base with a recessed cup for the mercury, a post to hang the motor on, and a brass strip to act as pivot arm complete the design. The motor will run on six volts from an ordinary storage battery, and develops about 2000 r.p.m.

Potato Makes Good Rheostat

FOR charging storage batteries and for similar purposes a potato can be used as a rheostat instead of lamp resistances. Potatoes are salty and make better conductors of current than a salt water solution. Simply slice a bit of the outer skin from the potato, tap the input and output wires and insert them in the potato. By spacing the wires varying distances apart, a variation in the current density will be produced. The resistance can be increased to any amount by plugging two potatoes in series.

Simple Step-down TRANSFORMER

By T. S. ASGAARD

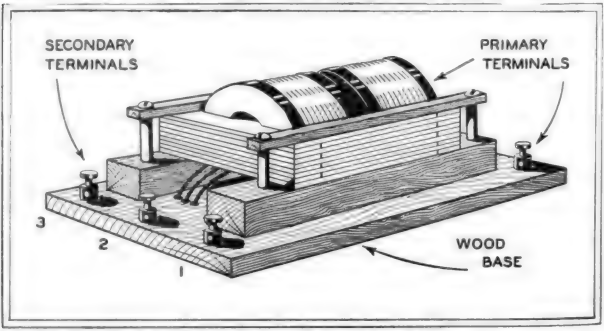
THE step-down transformer which I am about to describe can be built for less than a dollar, and with it you can produce voltages of any potential you desire, which cannot be done with the ordinary toy type transformer. Electrolytic deposition and other experiments call for higher voltages than the small transformer can give, but the design presented herewith is satisfactory for such uses.

In construction and principle a transformer is really quite simple, consisting of two coils of wire wound around an iron core. One coil contains a great many turns of fine wire; this is connected to the 110-volt alternating current and is called the primary. The other coil is made up of a lesser number of turns of heavier wire and is called the secondary.

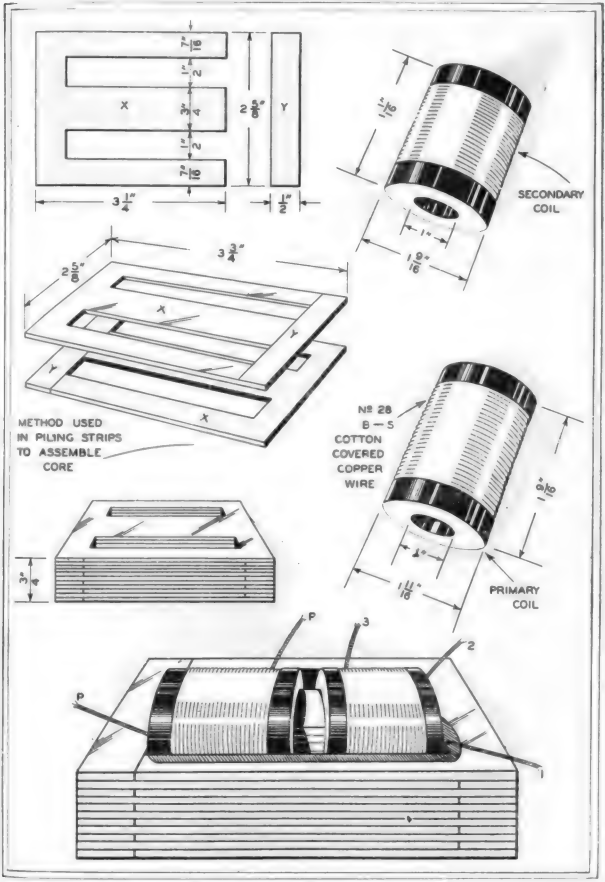
The first step in making the transformer is to secure some sheet iron of the type used in making stovepipes, which is known as stovepipe iron. This will have to be cut into a number of pieces shaped like X and Y in the drawing at the left. A sufficient quantity of these will be required to make a pile three quarters of an inch thick when pressed tightly together. When one piece of X and Y is cut, use them as a model for the other pieces. These pieces are used in building up the core as shown, in which strips X and Y are piled in alternately reversed positions.

Next come the windings, which are formed on a cardboard tube with an inside diameter of 1 1/16 inches. The tubes may be made by rolling a strip of wrapping paper around a broom handle. Dimensions for the coils are given in the drawing. The secondary is composed of 120 turns of No. 17 B&S gauge single cotton covered wire, wound in six layers. A tap is led out at the end of the second layer. The primary is composed of 1040 turns of No. 28 B&S gauge wire laid in 13 layers.

After the windings are finished they are ready to assemble on the core. The primary and the secondary slip over the center tongue of the X strips, and the transformer is ready for mounting. The method shown in the drawing is offered as a suggestion which will allow the experimenter to tap the secondary at will to get the exact voltage desired. The transformer core rests on two wooden strips which are held to the wood base with round head screws. The terminals of the primary winding, marked P and P, are led to the terminals on the baseboard, while the secondary terminals lead to binding posts marked 1, 2, and 3. For the voltage output you have three choices: Posts 1 to 2 give 2 volts; 2 to 3 give 8 volts; 1 to 3 give 12 volts.



The completed transformer. The binding posts 1, 2, and 3 deliver different voltage combinations.


X
Y
3 1/4"
1/2"
SECONDARY COIL
1"
1 9/16"
3 3/4"
METHOD USED IN PILING STRIPS TO ASSEMBLE CORE
№ 28 B—S COTTON COVERED COPPER WIRE
PRIMARY COIL
1 11/16"
P
3
2
1

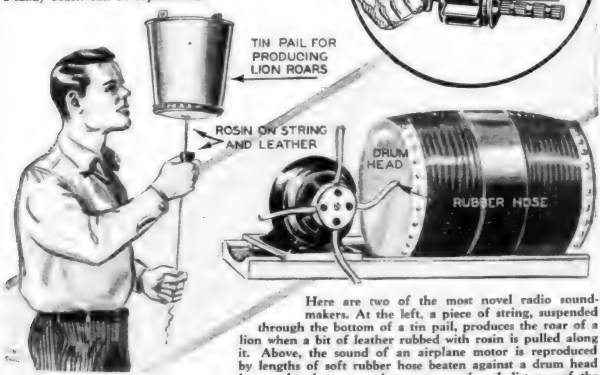
How Ingenious Sound Producing

You can't always believe what you hear over the radio—the picture above proves it. Sound producing machinery of a large chain broadcasting company is shown. Thirty-three separate sound effects are produced by the cabinet before which the operator is sitting, but in addition to this a large number of individual devices are employed, including numerous bells of various tones, a cigar box with a pulley and piece of string to simulate the sound of a curtain being drawn in a theater, oar locks used in acts calling for a rowboat, and a pillow to be struck with slats to produce the thudding effect of a prize fight blow against human flesh. Drawing a taut rubber band over a length of broomstick produces sound of a watch being wound.

The complete effect of a locomotive pulling out of a station is produced for radio audiences with these devices. Roller skates mounted on a revolving drum simulate click of train wheels over the rail joints. At right, a corrugated surface produces the puffing effect of a locomotive when wire brush is rasped across it.

Devices Fool Radio Microphone

Sea and water effects are produced with drums, two types of which are shown in the above drawing. Both are loaded with small peas and stones which rattle over corrugated surfaces, the main difference being that one drum contains a heavier "charge" of stones than the other. Thus, when used in unison, both the roar of beating sea waves and the soft swish of water against a sandy beach can be reproduced.



Here are two of the most novel radio sound-makers. At the left, a piece of string, suspended through the bottom of a tin pail, produces the roar of a lion when a bit of leather rubbed with rosin is pulled along it. Above, the sound of an airplane motor is reproduced by lengths of soft rubber hose beaten against a drum head by an electric motor. Apparent speed and distance of the airplane is controlled by regulating the small motor to speed up or slow down the revolving hose.

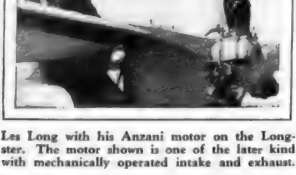
How to BUILD the

Here, in outline form, is one of the nicest little monoplane designs that has come into this office. Complete plans are given, making it a notable addition to the fast growing Modern Mechanics Library of lightplane plans.

THE little ship described in this article is the result of no small amount of planning and hard work. My brother and I are the proprietors of a small radio factory, and during the past ten years have had a hankering to experiment with light planes. We finally arranged to do this and we find it the most interesting hobby one could hope to have.

This Anzani "Longster" is the second ship built. The first one flew very well, but had some irritating habits and was finally dismantled. In designing the *Longster* much thought was given to planning a ship that would be easily, quickly and cheaply built. There are several details of construction that we believe will be of great help to sport plane builders, and which so far as we know are original with us.

As to performance, the plane has greatly exceeded our hopes. Its measured speed over a five-mile course, four times each way, is 91 miles per hour, and the landing speed appears to be about 32 miles per hour. The takeoff run in an ordinary stubble field is never over 150 feet in still air, and in over 75 flights it has never bounced two feet off the ground in landing. However, its stability is its main feature. Three experienced test pilots flew it and each of them pronounced it the most stable ship he was ever in. To show you how it behaves, the test pilot who first flew had never even seen it before. He got in it, ran it up and down the field twice and then took it off and flew completely out of sight before bringing it back and landing it.



Les Long with his Anzani motor on the Longster. The motor shown is one of the later kind with mechanically operated intake and exhaust.

But listen to this—on its very next flight it was taken up by a student who had been soloed at 1½ hours, who had had but two hours in the air in his life and who hadn't flown for a year. He took it off, stayed up half an hour and landed perfectly and then flew it nearly every day for the following six weeks without the slightest trouble. After three months of flying it hasn't even a busted shock cord, although it has had two forced landings.

In looking around for a motor we decided on the 35 h.p. Anzani because they are fairly low priced and easy to work on. The propeller was made by the Storey Co., and is 6-ft. diameter by 4-ft. pitch. The motor requires about 2¾ gallons of gas per hour, which means about 30 miles per gallon.

In proceeding with the description we are going to assume that you have some knowledge of light plane building. No attempt will be made to go into minute details. Back issues of the FLYING MANUAL have had many articles that may be turned to if in doubt. This plane weighs but 425 lbs. empty and practically any proven sport plane material or construction will be satisfactory.

When you begin actual construction our advice is that you begin with the tail surfaces. By so doing you will get an idea of what the work is like and if you spoil anything there isn't much loss. Note the drawings carefully. The stabilizer and elevator are practically identical. All beams and braces are the same size stock, ¾ by 1 inch airplane spruce. The ribs are 3/16 by ¾ spruce. The trailing and leading edges are all ¼ by 22 gauge steel, either 1025 or chrome-molybdenum.

In making either part, lay out the two beams on a level floor, mark off the rib

"LONGSTER"

by LES LONG

A good design for tall grass, albeit the ship is a little large as we have come to think of the usual lightplane. The ship has flown in all weathers. The mid-wing type gives a ship that is quick on the controls. It has a cushioning effect in landing not possessed by high-wing types.

positions and put together with 20 ga. by one inch nails and casein glue. Be sure that it is all square and then put in the diagonal braces, using bevelled blocks at the joints. Bring the tips of the ribs together and nail and glue. Bend the steel outline to shape and fasten it on with 22 ga. tin of copper straps at each rib and beam end. Nail the straps well and then solder them to the tubing.

The hinges are eyebolts, size 3/16, which may be had of airplane supply houses such as the Heath Airplane Co. Use large washers to keep the bolts from cutting into the wood. The blocks for the bolts in the stabilizer are simply pieces of the beam stock glued and nailed on. The center rib of the elevator takes the control horn and is filled solid with a piece of beam stock as far back as the rear beam. Make up the horn as shown and bolt it securely, and *cotter or rivet the nuts.* Don't fail to do this with every nut in the ship. Don't take chances.

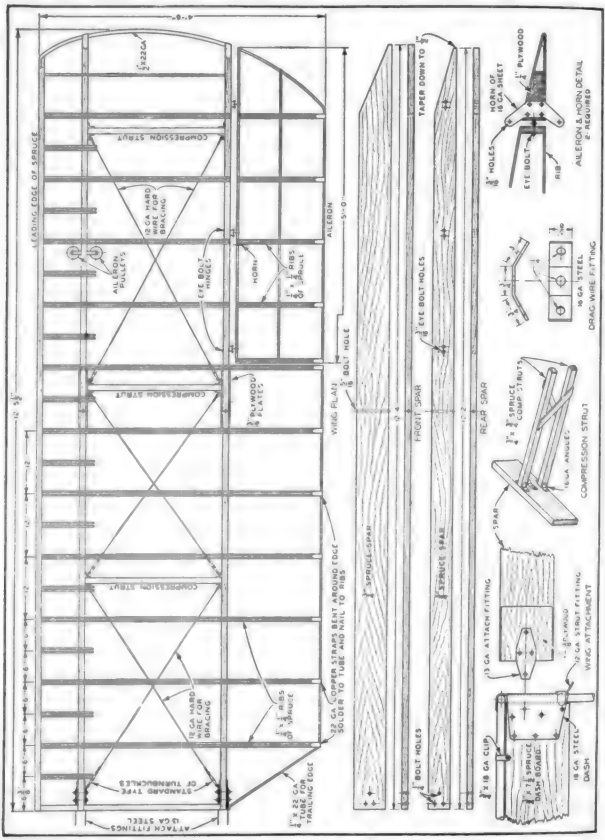
The tubing in these surfaces, as well as all tubing in the ship should be soused on the inside with *hot* linseed oil to prevent rusting. All bolts should be zinc or cadmium plated aircraft bolts. Where the bolts go through the stabilizer pieces of 3/16 plywood are to be glued and nailed to raise the blocks to the level of the ribs. Give the completed frames a coat of good oil paint or spar varnish and they are ready for covering. The rudder and fin are made exactly the same, except that the leading edge of the fin is 5/16 by 20 ga. tubing, reinforced and flattened at the bottom for the bolt hole. All bolts are ¼ inch except the two that hold the elevator horn, which are 3/16.

When you get this far try your hand at covering. Use regular airplane fabric, or you can use the cloth known as "Pequot" muslin. Pull the cloth over the beams and stitch clear around the edges. Stitch the ribs with a quilt stitch three inches apart with rib cord. Put on one coat of clear dope and then apply tape on all edges and over the ribs. Put on a total of four coats of clear dope and two coats of any color you fancy of pigmented dope. The surfaces should now be drum tight and ready to go.

You should now know whether you want to build an airplane or not. If so, the next thing will be the wings. We think you will be surprised at the ease with which they can be built. This is mostly due to the novel rib construction. As you will note, the rib has many advantages. In the first place it can be made complete in ten minutes, which is much less time than required on the usual rib. Next, there is only one size stock to buy, ¼ by ¼ spruce, and there is no waste as all scraps can be used for bracing. There are many other advantages such as ease of repair and fitting in of reinforcement pieces where required.

The rib is the regular Clark Y, of 4½-foot chord and with the beams at 15% and

Les Long's Anzani Ship Is Very Simply Built—It Flies on 35 H. P.



Solid are the spars of this little ship, and they need no routing. They are a trifle heavier than the spars in the Heath Parasol, and pretty close to as heavy as the spars in a Waco, which are 12, unrouted. The aileron attachment method is illustrated, and so is the means by which the dashboard is attached. The ailerons hinge directly on the rear spar; simplicity itself.

Les Long climbs into the cockpit of his new Longster as a few spectators gape. Wide tarmac, foggy in the early morning; a new ship, and the thrill of the first test hop! What private pilot could forget the thrill of such an event? Note Les's peculiar rudder design and braced wing.

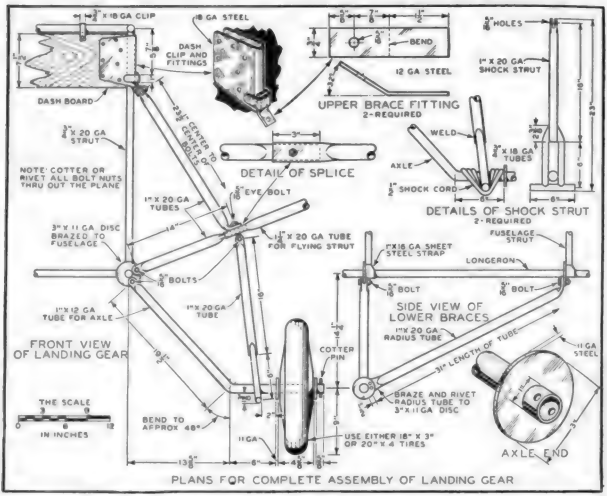
65%. Make up the complete set and save the jig for future use. This jig is simply a flat board with the rib outline drawn on it and with headless nails driven around the outline to hold the strips. Steam the front end of the ¼ by ¼ strips and put in two at the top and two at the bottom. Separate each pair slightly so that the bracing struts may be slipped between. Take a piece of stock and note where it is going to strike the cap strips. Apply glue there and then slip it between and put one 1-inch 20-ga. brad square through both halves of the cap and the strut. This makes a self-gussetted joint that is very strong and light. Fill in the whole outline, leaving the ¾ inch width slots for the beams. Let the rough ends of the bracing pieces stick through till the rib is completed and removed from the jig, when they may be trimmed with a sharp knife or saw. The completed rib will weigh 3½ ounces and you are going to enjoy making it. It just about solves the wing problem.

The beams are selected spruce, ¾ inch thick. The front one is 12 feet four inches, and the rear one 12 feet 2 inches long. They are tapered at the outer end from the last rib to a width of ½ inch and the ends fitted to the wing tip tubing, which is ½ by 20 ga. bent as shown. The beams are fitted and beveled till they just fit the slots in the ribs. The ribs are then slipped on and spaced one foot apart. Before nailing them on, the drag bracing is to be put in. The drag struts are double, a ¾ by ¾ strut being placed at the tops and bottoms of the spars and fastened with 16 ga. steel angles and screws. The wire pulls are placed at the center of the spars, between the drag struts. A piece of ¾ spruce, 1½ inches wide and the height of the spar is placed on the backs of the spars and the ¼ bolts that hold the pulls are run through. The blocks are to keep the spars from buckling. The pulls are the usual type, 16 ga. by 1 inch wide stock.

Use 12 ga. hard wire for bracing, with standard turnbuckles. True the wing up accurately and fasten the ribs with glue and brads. It will be noted that where the wing

This gives one a good idea of how the skeleton of the plane looks with the Anzani 35 h.p. motor.

Home-Designed Split Type Landing Gear Shows Long's Ingenuity



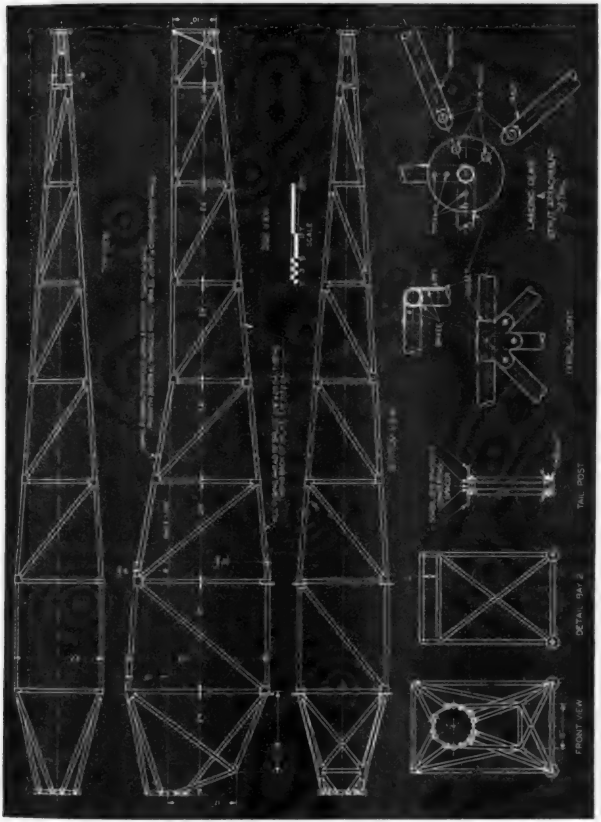
Although we have never seen a landing gear with the features incorporated in this one before, it has withstood the tests of a lot of flying and no doubt is easy on the ship.

struts come, the spars are reinforced with ¾ plywood plates the full width of the spars and 11 inches long. The flying strut bolts are 5/16 diameter and go straight through the center of the spars. Pieces of oak or ash, not shown, are placed on top and bottom of the spars to take the strain off the bolts. These pieces are ¾ thick. Glue and nail these plates and cap pieces securely.

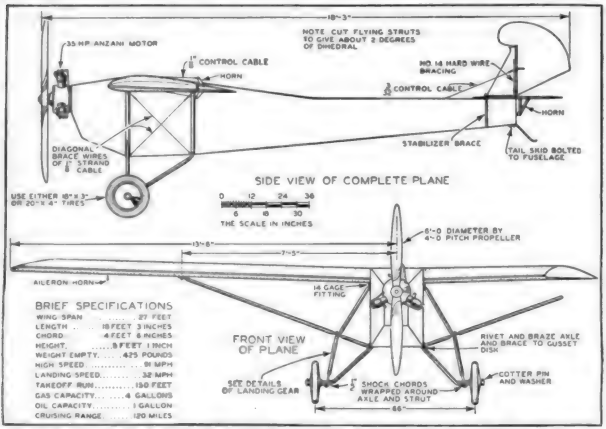
At the butts of the beams a piece of 1/16 plywood is glued and nailed on both sides and on these the wing attachment plates are bolted. The plates are simple pieces of 13 ga. steel. They slip over the fuselage struts and bolt to the wood crosspieces at the front and rear of the cockpit. The nosepiece, trailing edge and aileron pulleys are all standard type. The nose ribs are made in the rib jig the same as a rib, but stopping at the rear of the front spar. The end rib of the wing is about half as high as the others, made of ¼ plywood with lightening holes. This is to give a neat slope to the fabric.

The ailerons are made up right with the wing. In making the ribs four of them for each wing are made with the vertical strut that comes just back of the rear beam set back 1¼ inches. This allows for a space of 1 inch between rear spar and aileron after the ¼ inch thick front aileron spar is fastened in. The rear aileron spar is slipped in likewise to the rear of the final vertical rib strut and glued and nailed. The rib that supports the control horn is filled in with ¼ plywood to which the horn is bolted. The horn is 16 ga. sheet cut as shown. Hinges are standard eyebolt. Cover and dope the wings the same as the tail group, and that's that.

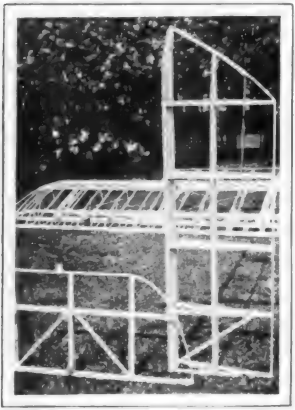
The fuselage construction is rather unusual, but it is the only practical method for the amateur builder who wants a self-braced job. Welding is out of the question



The joint at the fourth vertical bay at first glance looks as though there might be a redundant member there, but hundreds of hours of flying time have proven the job entirely strong enough. The fuselage is made by placing the enlarged drawing of this print on a bench, and using the diagram as a jig. You will also note that the motor mount is secured solidly. The joints are simply pin joints, easy to make.



In the old days of aviation, the days which savored of sportsmanship, one of the most popular types of plane was the little Nieuport 18 h.p. job which flew 60 m.p.h. The Longster retains much of the old Nieuport. Mr. Long is to be congratulated on his design and the fine article herewith.



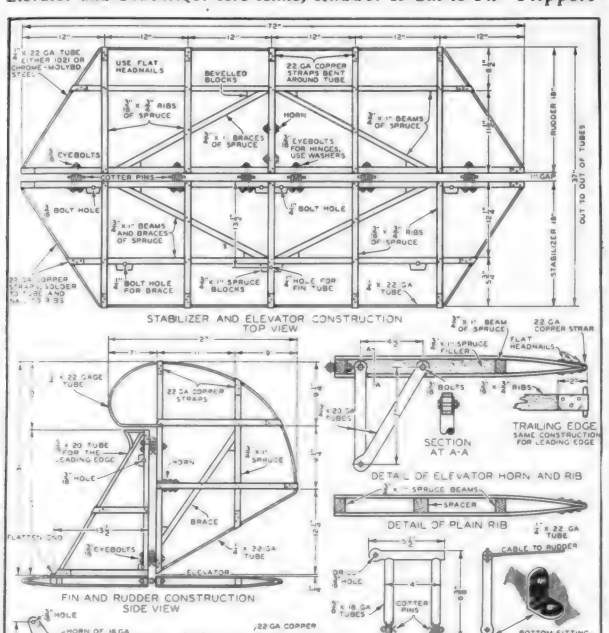
A wing and ailerons before being covered.

unless you can afford an experienced man's services. For that matter, welding on 22 ga. tubing is always a dubious proposition. We made many tests and the joint adopted is stronger in every way than the welded one. To bring steel to the brazing point does not hurt it and it will have its original temper when cool, while welding leaves the metal soft and weak. Bronze is ideal in many ways, for it flows into cracks easily and has great strength in a shear joint. Used with the gusset-plate method it gives an indestructible joint, besides leaving the tubing in its original condition of strength.

Lay out a jig of planks that will accommodate the dimensions shown. For a base line make a long straight line that is parallel with the top of the fuselage from the rear to the center station. Note this base line cuts through the center of the motor mount ring. Lay out the outlines in pencil and then drive 20 penny nails all around and whenever needed to hold tubing in place.

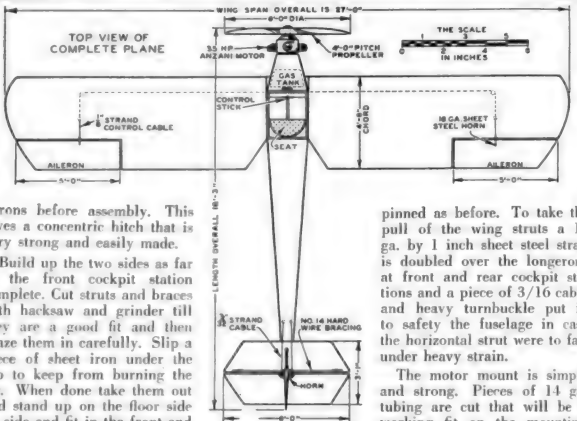
The longerons from the mount to just back of the 3rd station are 5/8 by 20 tubing.

Elevator and Stabilizer Are Alike; Rudder Is Cut to Fit "Flippers"



Here are the balance of the very unusual details of this most unusual little airplane. It should prove easy to build, and if carefully made will fly very well. Note the rudder control.

All tubing from there back is 5/8 by 22 ga. Make a fish-mouth splice with a 10-inch piece of 9/16 tubing inside and with several shingle nails put through. Braze the fishmouth and over the ends of the cut off nails. The four struts at the front and rear cockpit stations are 3/4 by 20 ga. All the rest is 5/8 by 20 ga. For the wing strut and axle attachments a simple 3-inch disk of 11 ga. steel is cut and a 5/8 hole drilled in the center. The 5/16 holes are drilled as shown and the disks slipped over the lon-



The proportions of this little ship show standard aeronautical monoplane practice. Trend today is toward narrower ailerons with greater aspect ratio.

gerons before assembly. This gives a concentric hitch that is very strong and easily made.

Build up the two sides as far as the front cockpit station complete. Cut struts and braces with hacksaw and grinder till they are a good fit and then braze them in carefully. Slip a piece of sheet iron under the job to keep from burning the jig. When done take them out and stand up on the floor side by side and fit in the front and rear cockpit cross struts. While still hot, bend the longerons so that the two sides are 6 inches apart at the front stabilizer station. Fill in the struts and braces as before, keeping careful watch that the longerons are straight. Use a square on the job frequently to keep everything trued up. Next put in the vertical diagonals, not shown, with a final check for squareness. The tail post is double as shown and is put together with 5/16 bolts that have had the heads cut off and the shank threaded. Spacers are used to allow the ¾ push rod to work between the two struts. If desired the struts, longerons, which are flattened, and the stabilizer and stabilizer brace brackets may be brazed together. The clip for holding the tail skid is 16 ga. by 1 inch wide. The skid itself is spring steel 3/16 thick.

All the gussets up to the cockpit station are 20 ga. sheet steel. They are cut to fit the place and carefully brazed on after which the holes for the rivets are drilled and the rivets, which are 3-penny nails, are put in with a drive fit and brazed over. The axle and strut disks are carefully brazed to both vertical and horizontal struts and then pinned as before. To take the pull of the wing struts a 16 ga. by 1 inch sheet steel strap is doubled over the longerons at front and rear cockpit stations and a piece of 3/16 cable and heavy turnbuckle put in to safety the fuselage in case the horizontal strut were to fail under heavy strain.

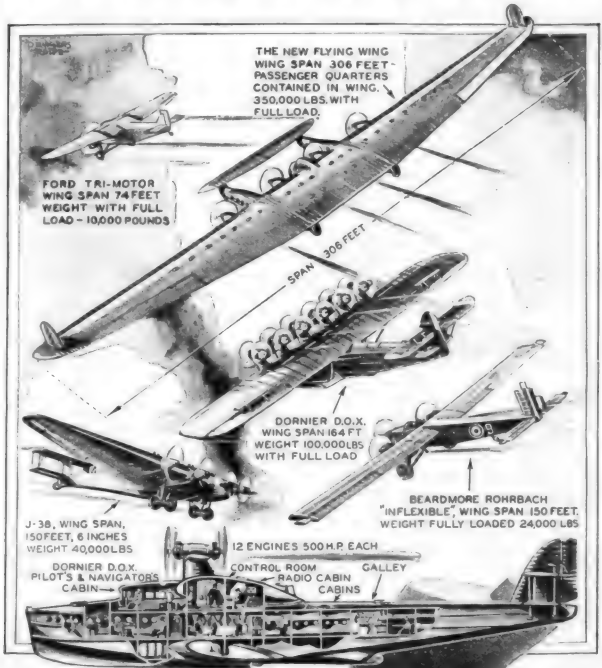
The motor mount is simple and strong. Pieces of 14 ga. tubing are cut that will be a working fit on the mounting bolts on the engine. These pieces are ¾ of an inch long. They are placed on the bolts and then a length of bar steel, 3/16 thick by ¾ wide is carefully bent around them, making a hexagon or octagon shape as the case may be. The ends of the strip are lap jointed and riveted and brazed. The completely formed ring is now placed back over the short lengths of tubing and the pieces are lightly brazed to it. After taking the completed ring off the bolts all the pieces of tubing are carefully brazed again. As heavy washers are used in bolting on the motor they bear both on the ends of the tubes and the ring itself, making an unbreakable job.

Use care in mounting the ring to see that it is square with the fuselage in all directions. Flatten the longerons at the proper place, reinforce them and fasten to the ring with 3/16 steel rivets, after which braze over the whole job. Such a joint can not be wrecked.

A word about reinforcing. The end of the tube is heated red, it is flattened and elliptical pieces of sheet steel are laid on both sides and bent to the shape of the tube

(Continued on page 192)

LEVIATHANS *of the Air*



A comparison of the world's largest planes, showing how Europe is forging ahead in the design of air liners.

GERMANY, forbidden to construct military planes, has turned her attention to commercial craft. The world had no sooner recovered its breath from viewing the Dornier "DO. X" than Junkers announced a plane which would carry 175 tons.

Above is shown how America's largest ship, the Ford Tri-motor, compares with Britain's giant Beardmore Rohrbach "Inflexible."

Photo Electric Eye Records the Precise Time of Sprinters

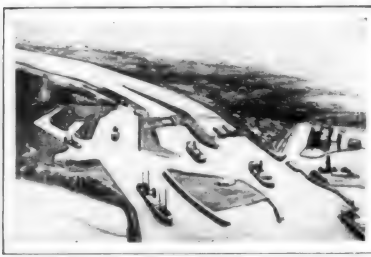
Report of starting pistol sets this timing device into operation, while interruption of the light beam across the finish line of the photo electric cell stops it, thus giving precise time of start and finish.

POSSIBILITY of error in timing the speed of sprinters is reduced to an absolute minimum with the new electric eye timing device recently invented and tested by two students of Haverford College. The report of the starting pistol sets the timing mechanism of the device in operation, and the crossing of the invisible light tape, as shown in the photo above, stops it, thus giving the precise moment of start and finish.

When the sprinter crosses the invisible light tape he interrupts a beam of light to a photo electric cell, thus actuating the indicating mechanism. By this means the time of finish can be determined to the one-hundredth of a second.

Holland Builds World's Largest Lock Connecting Amsterdam With Sea

LITTLE Holland is proud to announce to the world the completion of the largest lock in the world, larger, in fact, than the gigantic locks in the Panama or Kiel canals. The labor, the money, the materials and the brainwork of making the plans were all furnished by Holland herself, and Holland alone.



Model of world's largest lock, recently completed in Holland.

Requiring ten years and $7,000,000 in the building, the new lock forms the last mammoth link in the ship canal connecting Amsterdam with the North Sea, and thus with the Atlantic. With this canal, Amsterdam will thus have an outlet to the world's shipping lanes, and can become one of the world's major seaports.

In making plans for the construction of the mighty locks, engineers planned on its being used by some of the great leviathans that ply the ocean trade routes.

Special Controls Permit Crippled Man to Drive His Auto

TWENTY-THREE years ago, Alfred LeRoy lost both his legs and his left arm in a railroad accident. Today, he can do practically anything that any able-bodied man can do. Motoring is his hobby, and despite the lack of legs and one arm, he is a more competent driver than many persons in possession of a full quota of their members.

LeRoy's automobile, a Ford coupe, the interior arrangement of which is shown in the photo at the right, is a model of ingenuity for overcoming the physical disability of the driver. It is fitted with a system of controls by which brakes, gear shift, and throttle are handled by his right hand—his one sound member. As an aid to steering he has a swivel-mounted ring on the steering wheel into which he hooks the stump of his left arm.

The motor starter is handled by a button on the dash board. He presses the button with the stump of his left arm while pulling the choke with his right hand. In lieu of arm signals in traffic the rear of the car is fitted with electric signals indicating "stop," "left" and "right." These signals are controlled from push buttons on the dash. LeRoy can change tires and make repairs on the motor without assistance.

The various controls of Mr. LeRoy's car are arranged as shown above. Braking and gear shifting is done with levers, while starter is operated by button on dashboard. Mr. LeRoy can make repairs or change tires without help.

Cow and Calf Moulded in Butter

BUTTER sculpture is the hobby of J. E. Wallace, of Inland, Neb. Above is a piece of her work on display at a dairy show.

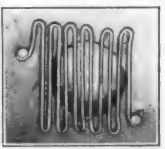
This novel statuette is moulded out of butter.

How to Save on Toothbrushes

INSTEAD of throwing your old toothbrush away, hang it up while you are using the new one. When this one goes bad, the old one will be hard and dry, and in good condition to use again.

Strainer From Wire and Tacks

A VERY practical and efficient strainer can be quickly made by bending a piece of wire into the form shown at the right, and tacking it down through two closed hooks bent in each end. The fineness of the strainer can be regulated simply by making the bends closer together and more of them. It can be cleaned out readily without danger of poking a hole thru and spoiling it.



Wire bent and tacked over hole makes strainer.

Amazing ROBOTS Speed

After the population figures have been determined, the census cards are sent to a punching room where the facts about each individual in the United States are registered on a separate card. This is done by punching holes in the form card with this especially devised punching machine, by means of which a single clerk is able to punch 2,500 cards a day, whereas in 1920 the average per clerk was around 800 a day.

by **DR. JOSEPH A. HILL**
Assistant Director of the Census

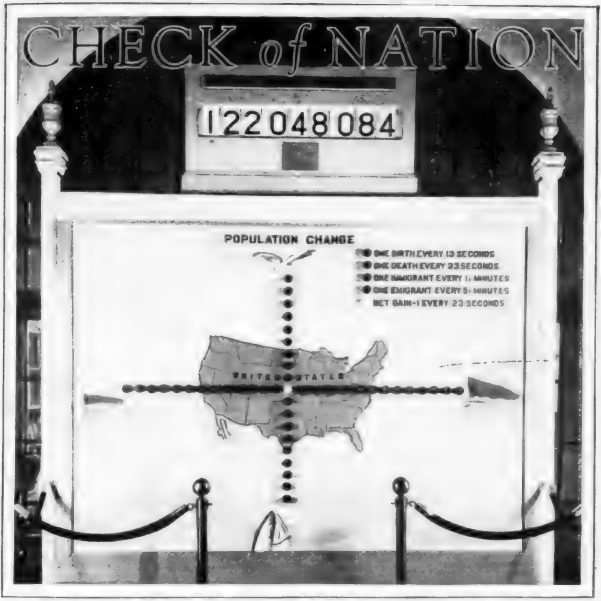
Although the population of the United States has more than doubled since the Civil War, Uncle Sam, with the aid of these amazing new machines which do everything but think, completes the count in one-third the time required in 1860.

DURING the past few months, while more than 100,000 census enumerators were counting the noses of over 120,000,000 residents of the United States, hundreds of visitors from every state in the union flocked into the offices of the Census Bureau in Washington.

What most of these enthusiastic people wanted to see first of all were a few of the marvelous mechanical devices that "do most everything but think."

Probably the one that inspired the greatest number of "oh's" and "ah's" was the clock-like apparatus that stands just outside the office of William M. Steuart, Director of the Census. This continuously estimates and registers the growth of the United States population as computed by statisticians.

Indeed, there is no other device of the kind anywhere else in the world. For this is the exclusive product of the combined minds of some of the very best technical experts of the Bureau. Designed so that the average visitor can visualize at a glance what the census men are achieving in their difficult task, the workmanship is unique.

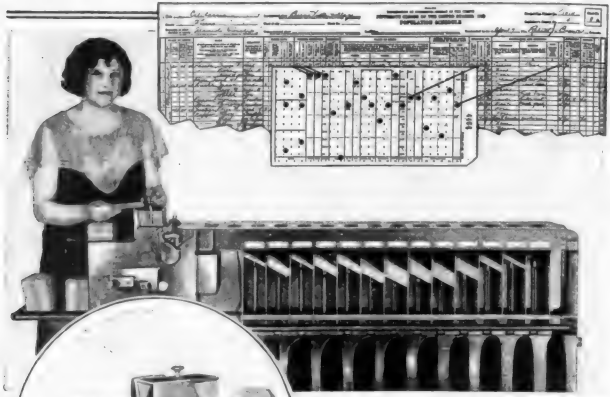


Just outside of Director Steuart's office stands this marvelous clocklike device. It continuously estimates and registers the growth of United States' population as computed by statisticians from the latest figures at hand. Every 23 seconds a white flash from the clock indicates a net increase of one.

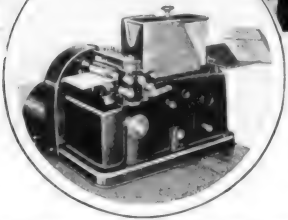
Glance at the accompanying picture and you will gain the correct impression of a great statistical chart, operated by automatic electrical control.

The large figure at the top represents the population of the United States on the morning of February 18, 1930, the time the photo was taken, and this figure changes continuously, according to the number of births, deaths, arrivals of immigrants and departures of emigrants. Statisticians have computed that there is a birth on an average of every 13 seconds, so that after that passage of time a tiny blue light (see picture) flashes. Similarly, a red light flashes every 23 seconds to denote a death; a green light flashes every 1½ minutes to represent the arrival of a new immigrant into the United States; a red light flashes every 5½ minutes to denote the departure of an emigrant from this country; while a white light flashes every 23 seconds to represent the net increase of one person to our population total.

You will notice from the picture that underneath the heading "Population Change," there are two additional rows of lights, the one horizontal, and the other vertical. Every time a birth is recorded a blue light flashes all the way from the topmost bulb in the vertical row, up near the stork, down to the white bulb in the very center. When a death is recorded, then a purple light flashes from the central white light down through the



This combination adding and tabulating machine can count and register 59 combinations of facts each time the cards are handled. The inset shows one of the 123,000 tabulating cards as completed from the accompanying original schedule.



After the main facts about each individual have been annotated on his card it is then placed in this especially devised machine called the "gang punch." Cards are fed automatically and four of them are punched at each stroke.

bulbs over Father Time.

Now, when an immigrant is recorded, green lights start flashing from the large boat on the right and move to the central white light; and when an emigrant leaves this country the fact is designated by a red light that starts flashing from the small boat on the left and continues to the white light in the center. The net gain is indicated by a flash from the white light in the center, while simultaneously a gain of one in our population is registered on the large counter at the top.

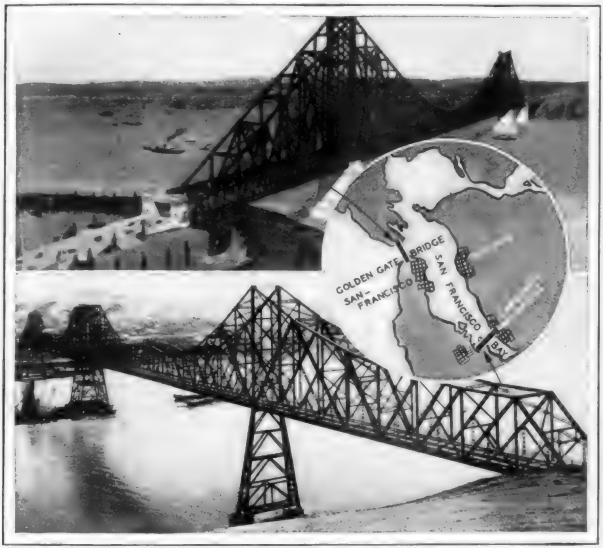
This automatic recording device is controlled by five motor-driven timing flashes, or switches, somewhat on the order of those utilized in the mammoth electrical sign boards of our metropolitan districts. Every morning at precisely 9 o'clock the apparatus is set up in accordance with latest figures on our estimated population and turned on, later to be turned off at 4:30 o'clock every afternoon.

It would be physically impossible to carry out the mammoth census program of the United States as it has developed during the last century and a half were it not for the aid of intricate machinery used to register, sort and tabulate the information after it is received. If the work were attempted by hand, so many clerks and copyists would be needed that they surely would trample over each other trying to work, and the errors probably would be so great that the statistics published would be of little value.

Certainly the machinery being used in compiling and tabulating the data collected in the 1930 census is far more efficient than it was ten years ago. New machines have been developed and old ones improved, so

(Continued on page 198)

Giant Span to LINK GOLDEN GATE



Above is an engineer's drawing of the bridge which will link San Francisco with Marin County. Below, the recently completed Carquinez bridge over Lower San Francisco Bay. Inset shows location of bridges.

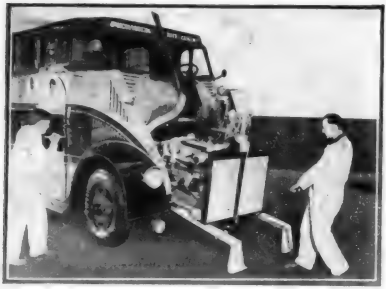
WITH test borings showing that a suitable foundation for the bridge piers may be obtained, arrangements are now under way to start construction on the longest suspension bridge in the world—the Golden Gate bridge which will connect San Francisco with Marin County and the north coast of California.

The Golden Gate bridge will be 85 feet in width and will provide two street railway lines, four auto lanes and two lines for pedestrians. The span between the two piers will be 4000 feet in length and will be constructed as a combination of cantilever and suspension, the suspension section of 7640 feet in length will occupy the center of the span.

The two cables used in the suspension section will be thirty inches in diameter and will carry 18,600 strands of wire each. The height of the towers above water level will be 760 feet, while the bridge floor will be 210 feet above mean high tide, thus permitting even the largest ships to pass under.

A project which has been under consideration for many years, the linking of San Francisco and Oakland with enormous moles spanned at the center with a bridge, has not yet reached the point where construction has been started. Bridges over San Pablo Bay at Vallejo and Benecia have been completed, while lower San Francisco Bay has recently been spanned by the Carquinez bridge.

MOTOR MECHANICS



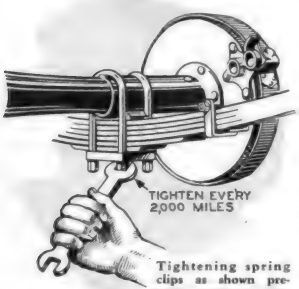
Edited by

RAY F. KUNS

Anyone who owns an automobile or other piece of motorized equipment will find this monthly department invaluable. Mr. Kuns is a recognized authority in the field of automotive mechanics, being principal of a trade school and author of a number of text books.

Tightening Spring Clips of Car Helps Prevent Breakage

THERE are two points at which spring breakage ordinarily occurs. One of these is near the eye of the spring. This is ordinarily due to setting up the spring bolts and shackles too tight. The other one is at the center of the spring and this is usually due to the fact that the spring shuttle clips are not kept tight. These should be gone over within 500 miles after the time a new car is put in service. Each 2,000 miles thereafter it is a good plan to inspect them to see that they are remaining tight.



Tightening spring clips as shown prevents a common source of breakage.

If they are allowed to become loose and the car is operated over rough roads with them in that condition, the springs may be broken at the center bolt position.

In many cases a ratchet type of socket wrench will speed up this work and make the job less irksome.

Driving Hints for October

IN THE northern sections the month of October usually brings the first frost, which is a reminder of the fact that there are certain units of the automobile requiring frost protection.

The first frost should be a reminder of the need of storage battery attention. Have it put into condition for winter service. As the long nights appear, give thought to the charging rate and have it set up so as to keep the battery fully charged.

When having the radiator serviced with anti-freeze, see that attention is given to the condition of the water hose connections and water pump packing as well as the expansion plate on the side of the engine (in some instances) to insure that none of the valuable anti-freeze solution is lost.

When using alcohol remember that it will dissolve the pyroxylin lacquer finish.

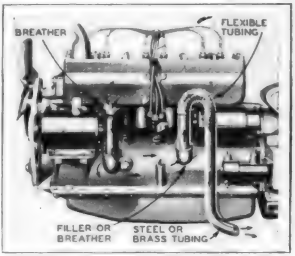
New car owners should be most careful about removing the radiator cap from a radiator in which the cooling solution has frozen, as very serious burns may result.

Crank Case Ventilator Keeps Exhaust Fumes From Car

THE discomfort of having oil fumes from the crank case sifting into the car through the floor boards is an annoyance which may readily be avoided by providing a crank case ventilator similar to the one sketched.

The advent and common use of high compression engines with their higher ratio of vacuum on the suction stroke, makes oil pumping more common than it was some years ago. It also provides a greater compression ratio within the engine, and more power being developed, more of the oil fumes are driven back into the crank case from which they find their way under the hood compartment and from that point into the car body.

The crank case ventilator may be attached to the breather tube, especially in the case where a breather tube and a filler tube are both used. Attach the ventilating device to either one of these, leaving the other open to the atmosphere. The draught of air past the lower end of the tube, as illustrated in the sketch, is sufficient to create a suction as the car is being driven rapidly forward. This suction draws air into the crank case at the breather tube and picks up the oil fumes and draws them out and carries them away under the sod pan of the car with the result that the disturbing fumes do not have a chance to reach the passengers.



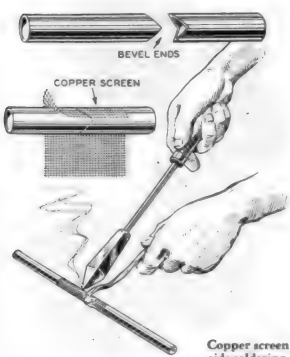
A crank case ventilator is easy to construct.

Interpreting the Oil Pressure Gauge

THE oil pressure gauge is indicative of the actual pressure of oil being fed to the bearings of the engine. If the pressure drops away it indicates that a portion of a bearing has let go or that the bearings have become worn to a point where the flow of oil is no longer impeded sufficiently to keep the pressure up to the original point.

Lack of pressure may be developed in case some dirt or foreign material is caught under the relief valve and it is held open. In such case the only thing needed is to remove the ball check or plunger check and have the dirt wiped out, after which the spring and ball check may be replaced.

High pressure is indicative of some stoppage in the oil line at some point. If foreign material, such as carbon, which has dried, becomes dislodged and finds its way to the oiling system, it may lodge within one of the small holes in the oiling system and cause a stoppage which results in high pressure on the oil gauge and eventual bearing failure. It pays to be suspicious of either abnormally high or low oil pressure.



Copper screen aids soldering.

Copper Screen for Soldering

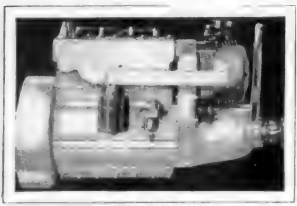
WHEN soldering a crack in a radiator or other place about the car where there is more or less strain, it is a very decided help to reinforce the joint by first soldering over the break with a coating of solder and then placing a strip of fine mesh copper screen over the work and soldering or sweating it in place. This method may be used with success when splicing tubing.

The "Why" of Supercharging

by **W. S. REED**

Chief Engineer, Niagara Motor Co.

SUPERCHARGERS made their first appearance as standard equipment on stock marine engines at the recent New York boat show, where the Niagara Motors Corp. exhibited stock engines so equipped. This method of introducing the explosive mixture into the cylinder, while it has been used in various forms on racing automobiles



Normally developing 30 h.p., this Niagara motor designed by Mr. Reed develops close to 70 h.p. with the Root type supercharger. Revolutions per minute are not increased.

and a few individually built marine engines, is new to the average engine owner.

Consequently the editors of MODERN MECHANICS have been besieged with questions as to the reason for, the construction of, and the operating principles of the supercharger, and they have therefore asked me to write this article which would explain these things in non-technical language for the benefit of Double-M readers.

The word "supercharger" as applied to motor cars and marine engines is somewhat misleading and really should be "full-charger." Its purpose is not to force a "super" charge into the engine but merely to insure that each cylinder shall be properly and completely filled with the gasoline vapor whose explosions against the pistons generate the power which the engine delivers.

In other words, it simply puts more explosive material behind each power stroke of the piston and thereby increases the power of your engine—and does this merely by filling each cylinder to its total capacity instead of only to the 60 or 70 per cent of it which is so often the case with engines not equipped with charging devices. This is not "super" charging but only full charging. However, the device has been universally known as the "supercharger" and will be so called in this article.

Perhaps the best way to approach the subject is first to describe what takes place inside the conventional four-cycle gasoline engine that is *not* equipped with a supercharger. Such an engine depends upon the suction generated by the down stroke of the piston to draw the gasoline vapor into the cylinder from the carburetor through the intake manifold. Under this unusual system of drawing the vapor into the cylinders by the force of piston suction alone, it is seldom that all of the cylinders are always fully charged, that is, completely filled with the explosive mixture. For example, as the number of engine revolutions per minute is increased, as the engine is speeded up, the time for each suction stroke of the piston becomes shorter and the quick, short suction that is obtained at high engine speed is not able to fill the cylinder completely.

For a simple demonstration of this principle, try to draw soda through a straw in quick, hurried gulps and notice how much less liquid is drawn up in this manner than by slow, steady suction. How much the power of suction decreases at full engine speed—and therefore how much of your cylinder capacity is ordinarily wasted at these speeds—is shown by the following engineering data:

Suppose for example a cylinder of 50 cubic inches capacity has, at low speeds (say 1000 revolutions per minute) a compression of 100 pounds to the square inch, which is about the average nowadays. As this engine gets towards 3000 revolutions per minute it will be found that the compression drops to around 60 pounds per square inch, unless an extraordinary design is offered. This means that the volumetric efficiency of the engine is only 60 per cent at high speed, or in other words you get approximately only 60 per cent filling of your total cylinder capacity. This means

that at the higher speeds you are getting out of each cylinder only about 60 per cent of the power that you would get if the cylinder were being completely filled with gasoline vapor. That is why an engine, which develops 50 horsepower at 1000 revolutions per minute, will not develop 150 horsepower at 3000 revolutions per minute.

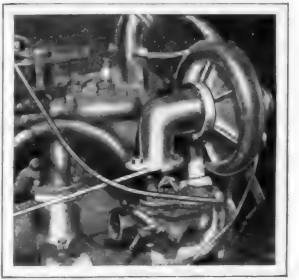
Now, if this same engine is equipped with a supercharger it does not lose that 40 pounds compression at full speed, because instead of the suction alone being depended upon to fill the cylinders the supercharger is *pushing* the vapor along from behind. For a supercharger is nothing more or less than a blower connected to the carburetor forcing the vapor into the cylinder by positive pressure from without. Superchargers are of several kinds and types but all of them operate upon this fundamental principle.

The particular type which we shall consider in this article and which is especially suitable for use on marine engines for ordinary use is the Roots blower which is shown in the accompanying drawing. This is basically the same device that the P. H. & F. M. Roots Co., of Connersville, Ind., have been manufacturing for nearly 50 years and which has proven its simplicity, durability, and positiveness of action through nearly a half-century of use in foundries, furnaces and wherever air under pressure is required.

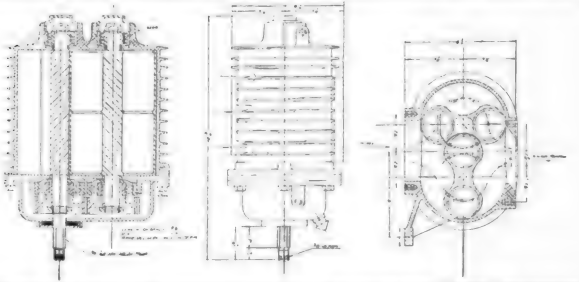
The diagram at the right of the drawing, which shows a cross-section of the working parts, indicates clearly the operation of the device. The air is taken through the carburetor in the usual way and then into the blower through the intake pipe shown at the left. From there it is forced through the central air chamber and so to the cylinder through the outlet at the right by the rotation of the two wings or rotors which revolve in opposite directions as indicated by the arrows. The rotation of these wings not only forces the vapor into the cylinder under pressure but also mixes the air and gasoline more thoroughly with the result that even a mixture which may not have been perfect

(Continued on page 204)

Supercharger for Model A Fords

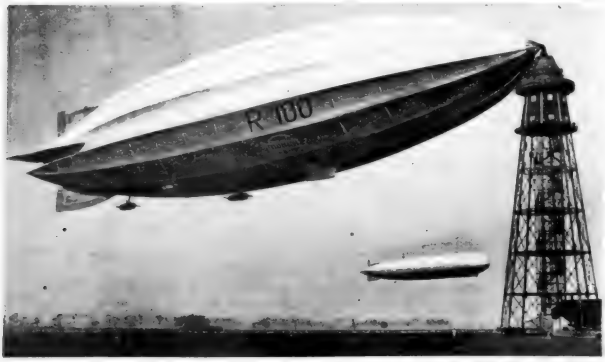


Hoot Gibson, movie star, is making a centrifugal supercharger, simplest type, for Ford model A cars. Higher speed can be had.



The positive, or Root blower type of supercharger is the logical selection of all types. It does not have to be balanced as does a centrifugal blower, and is far less costly. It lasts the life of the engine, and uses no more power than a generator or pump.

Damaged Fin CHEATS



The R-100 as she appeared moored to her mast at Cardington, England. The Graf Zeppelin shown in the background, offers an interesting contrast between the two giant dirigibles. The R-100 has a capacity of 5,150,000 cubic feet of gas, is 709 feet long, and has a cruising capacity of 6,000 miles.

ANOTHER brilliant chapter was written in dirigible history when the R-100, Great Britain's challenge to Germany's supremacy in lighter-than-air navigation, anchored at St. Hubert's Air Station near Montreal after a successful trans-Atlantic flight from Cardington, England.

The 3300-mile trip was completed in 78 hours and 51 minutes, but according to Squadron Leader R. S. Booth, the airship commander, the ship would have anchored fully twelve hours sooner had not a damaged fin delayed the trip several hours, compelling the dirigible to circle above the Montreal airport most of the night, awaiting daylight before attempting a landing.

Until the very last lap of the journey the R-100 was making record breaking time. Perfect weather was encountered over the ocean and the giant ship at times made better than seventy miles an hour.

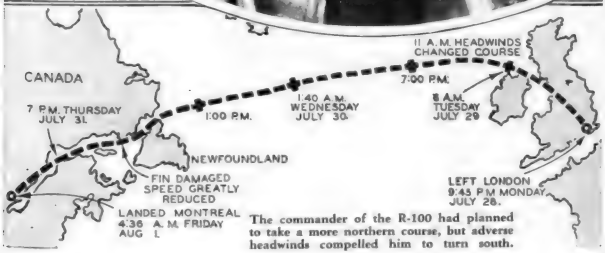
After entering the St. Lawrence valley, however, storms and head winds were encountered. One twisting gust of wind caught under the fabric of one of the stabilizer fins and tore it loose. The engines were at once throttled down so that the wind would not be able to tear further at the fabric, while the crew of the ship clambered up into the fin and made temporary repairs. The dirigible was forced to continue the trip at reduced speed in order that undue strain would not be placed upon the damaged member.

The R-100 carried 44 persons on the flight. There were five officers, 32 members of the crew, and seven observers and officials. 2,000 pounds of food and 500 gallons of drinking and washing water were carried. Meals were served in a spacious dining room and were cooked in an adjoining kitchen.

The airship was equipped with long wave wireless transmission and long and short wave reception. Throughout the trip the wireless station at St. Hubert and ships at sea were in intermittent touch with the dirigible.

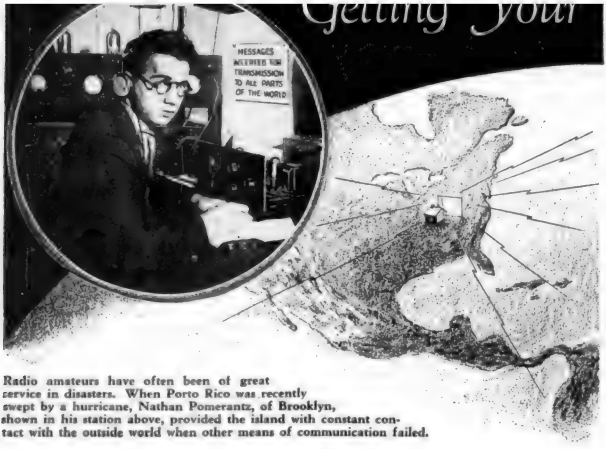
R-100 out of Air Record

Above is shown the spacious dining room on the R-100. Although furnished as completely as an ocean liner, all materials are extremely light in weight. At the right is shown the interior of the control cabin, with an officer giving orders to the ground crew upon landing. Below is shown the course of the trans-Atlantic flight.



The commander of the R-100 had planned to take a more northern course, but adverse headwinds compelled him to turn south.

Getting Your



Radio amateurs have often been of great service in disasters. When Porto Rico was recently swept by a hurricane, Nathan Pomerantz, of Brooklyn, shown in his station above, provided the island with constant contact with the outside world when other means of communication failed.

by **L. B. ROBBINS**

To judge by the letters that have been flooding the radio editor's desk, many Modern Mechanics radio fans want to open up amateur sending stations, but don't know just how to go about getting a government license. In this article, Mr. Robbins, operator of W1AFQ, who has been through the mill, tells you how.

IF YOU are thinking seriously of joining that world-wide fraternity of radio amateurs who carry on conversations with each other through the medium of their short wave transmitters and receivers, you will have to give some thought first of all to the simple demands that the government makes of all radio amateurs. This is no more than fair. It is positively necessary to obtain a license both for yourself and your station, as it is illegal to transmit one little dot or dash or voice signal before taking out these permits.

However, don't be dismayed, for the permits cost nothing and are not difficult to procure. What is chiefly necessary is a little plain stick-to-itiveness. And when in the end you have secured your license and are operating your own transmitter, you will find the absorbing and fascinating world of amateur radio opened before you.

A radio amateur operator's license requires first of all an ability to receive and transmit the Continental Morse Code, which is given in the box on the next page, at a speed of 10 words per minute. So the first thing to do is to memorize this code thoroughly, so that you can prove your knowledge of it to your examining officer.

A good way to do this is to learn all the characters by sight, and then, taking several sheets of paper, set down the characters by their radio symbols, filling sheet after sheet, as long as you can. You can not put in too much time practicing. When you are able to repeat the entire code with-

Radio Amateur's License

Above is shown amateur station W1AFQ, operated by Mr. Robbins. Note neat, efficient layout of apparatus. The transmitter, receiver, key and control panel are within easy reach while operating.

To send with ease and clearness, rest your arm and hold the transmitting key as shown in the above photo.

out the printed sheet before you, you will have made considerable progress.

After you have memorized the code in this manner, you can get further practice by using your spare time in reading signboards, placards, and even pages of type, in radio language, repeating the letters to yourself by "dits" and "darhs" instead of the usual spelling. If some characters come hard, concentrate on these particular ones especially.

When you feel you are able to repeat the characters backwards and forwards, so to speak, then you can commence to learn by actual sound from some other source. The portable code practice set described on page 121 of this issue of MODERN MECHANICS will prove excellent for this task. In all your practice from now on you must learn to recognize sounds instead of visual symbols.

The best method of learning to master the code is to listen in on your short wave receiver to the thousands of amateur and commercial stations working on the high frequencies. Occasionally a station will be found sending at a speed of from five to ten words per minute. Listen in for a while until you gain a faint idea of the dots and dashes, their spacing and their rhythm. Then with the printed Continental Morse code before you, try and pick out an occasional letter or group of letters and write them down. When you miss letters never stop to think what they were, but go right ahead and copy all you can of

(Continued on page 182)

THE CONTINENTAL MORSE CODE
Used by Radio Amateurs

A	· —	W	· — —
B	— · · ·	X	— · · —
C	— · — ·	Y	— · — —
D	— · ·	Z	— — · ·
E	·	1	· — — — —
F	· · — ·	2	· · — — —
G	— — ·	3	· · · — —
H	· · · ·	4	· · · · —
I	· ·	5	· · · · ·
J	· — — —	6	— · · · ·
K	— · —	7	— — · · ·
L	· — · ·	8	— — — · ·
M	— —	9	— — — — ·
N	— ·	0	— — — — —
O	— — —	Period	· — · — · —
P	· — — ·	Question	· · — — · ·
Q	— — · —	Break	— · · · —
R	· — ·	O.K.	· · · —
S	· · ·	or	— · · · —
T	—	Wait	· — · · ·
U	· · —	Finished	— · —
V	· · · —	Go ahead	— · —
		End of Message	· · · — · —

New Aerial Device Guides Landings in Thickest Fog

Electro-magnetic impulses guide planes to land and give exact readings of height and distances.

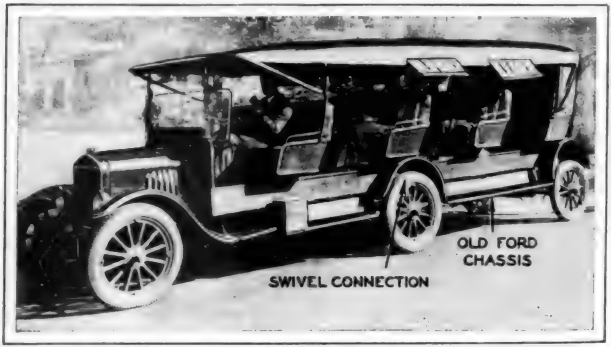
A NEW device designed to guide airplanes through darkness and fog, was given its first public demonstration recently at Detroit. The inventor is Earl C. Hanson.

The demonstration followed tests conducted at the Ford airport at Lansing, Ill., where planes were directed through bad weather and brought to the ground through the use of the invisible "pilot."

Mr. Hanson's device is based on the principle of electro-magnetic induction. Two series of energized cables are laid on the ground leading to an airport. The cables are parallel and each series gives off a signal code, one a series of dashes and the other a series of dots, so that a pilot picks up a continuous signal by flying between cables. This signal grows in intensity until the plane reaches the edge of the field where other cables, called the "gun coil," give the signal to cut motors and glide to a landing. Besides providing a directional signal, the cable also gives the pilot an exact reading of his actual height—a distinct improvement over the altimeter.

Home-made, Double Chassis Flivver Brings Thrills to Maine Vacationists

WHAT to do with the old flivver is well solved by the owner of this unique car. By hooking together two chassis he has made a serviceable bus for a Maine resort. A swivel keeps the rear car locked to the first.



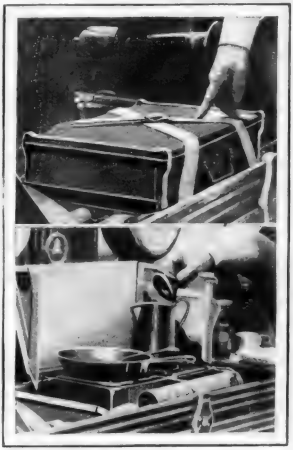
Two ancient flivvers make up the major part of the Maine resort bus shown in photo above. They are hooked together by a swivel. The owner earns a neat profit from thrill-seeking vacationists.

Camp Kitchenette Installed As a Permanent Accessory

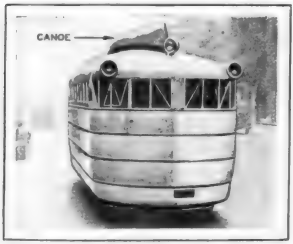
AMONG the innumerable motor campers there are probably very few who still employ the open camp fire for cooking. The gasoline camp stove is so much more satisfactory that probably the vast majority of habitual motor campers are now so equipped. Nevertheless, the convenience and satisfaction of such stoves can be further increased by installing them as a permanent accessory to the automobile for motor camping tours.

It is always more or less of a bother in making and breaking camp when the camp stove must be unpacked and re-packed. It is far more convenient to have the whole "commissary department" right on the front of the car where it is carried when not in use, and ready in a jiffy when a meal is to be prepared.

Almost any car that is equipped with a front bumper provides a handy place for carrying the camp stove and fitting up a convenient camp kitchenette. The space to be utilized is that in front of the radiator, behind the bumper, and between the fenders. Nearly all cars have some available fastenings for such an arrangement which may be utilized by making slight alterations that any mechanically inclined person can make with a few simple tools.



A closeup of the automobile bumper kitchenette in use. With this arrangement the entire assembly can be set up ready for use or knocked down to take the road in about two minutes.



This traveling bungalow contains four rooms.

Luxurious French Camping Car

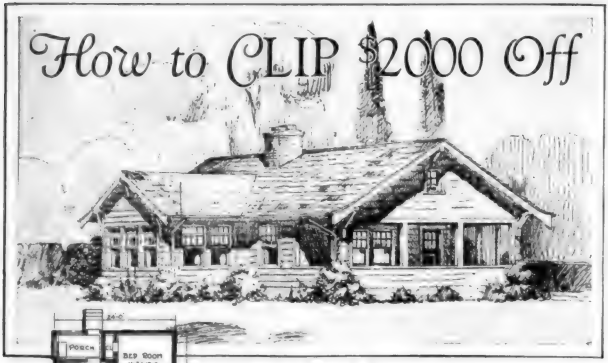
THE curious-shaped camping automobile pictured above, which has recently appeared at many of the European resorts, is one of the most luxurious motor homes ever seen. It includes a salon, bedroom, kitchen and bath, and is equipped with hot and cold water and a radio.

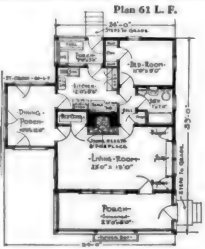
Hot Water Now From Any Faucet

THE new and improved "Hot Shot" electric water heater now makes hot water of any desired temperature instantly available wherever there is a faucet and an electric socket. Among the many new features are the automatic control which instantly shuts off the current when the water is turned off, and an "adapter," which permits attaching the heater to any tap, no matter what size and shape, by merely turning a thumb-screw.

The faucet clamp above fits taps of any size or shape.

How to CLIP $2000 Off





Here are shown two floor plans for the above bungalow. A detailed description with brief specifications may be obtained free by writing the Home Building Editor of Modern Mechanics.

Money is cheap, materials are lower, the construction market is scraping bottom. Now is the most advantageous time we've had in five years to build and save money. Mr. Flagg shows you how to save $2500 on a small house.

FOUR of the easiest ways I know of to save $2000 on a small house are illustrated in the triple purpose bungalow above.

Why is it called "triple purpose"? First, because it builds equally well as a permanent home for cities, suburbs and small towns, or as a temporary summer cottage and log cabin for lake and mountainside.

Second, the two floor plans give you a choice of living room lengthwise of the house or across the entire front. With these two arrangements you have the added choice of sleeping accommodations for four, six, eight and even more people.

Third, the cost is low for what the bungalow offers in both service and equipment. It has been built for around $2500. That figure is not a price guarantee by any means. It is stated only as a cost range to suggest how really reasonable a modern small house can be these days when strict attention is paid to saving space and labor and making certain rooms do double duty.

What about the four ways to clip a cool $2000 off your building bill?

If you build a cellarless house you may save from $500 to $700, depending upon the size of the house. A closet bed instead of an extra bedroom saves from $500 to $1000, according to wall bed manufacturers. By omitting a fireplace you save from $175 to $300. An upstairs or first floor heater may save another $175. Finally, if you are long on ambition and short on cash why not pull on a pair of overalls and do some of the rough work yourself? It may cut $500 off your labor bill. Labor is the largest single item of expense. Anything that saves labor

Your Building Bill

by MAURICE I. FLAGG

HOW TO GET A BLUEPRINT AND TWO PLAN BOOKS

A one-sheet blueprint of any house appearing in Modern Mechanics magazine may be had for $1.00, postage prepaid. Two new plan books, HOMES FOR NEWLYWEDS, containing 32 of the latest ideas for low cost homes in all styles, and 16 SELECTED HOMES FOR LEAN PURSES containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents postage prepaid. Address Home Building Editor, Modern Mechanics magazine, Minneapolis, Minn., for blueprints and plan books.

Combination breakfast nooks and kitchen tables are now made to fold up against the wall when not in use. They occupy not more than four inches when closed.

Cabinet heaters that look like furniture are practical for small homes. They are fitted with air humidifiers, and are rapidly replacing the old-fashioned parlor stove.

means less tax on the old pocketbook.

The above suggestions are practical. In savings they total more than $2000. And what's more, your finished house need not be shoddy in construction or skimped on style and comfort-giving features. Not at all.

There were plenty of crepe hangers when Ernest Flagg, nationally famous architect, designer of the Singer building, New York City, first advocated cellarless houses. "You will freeze to death without a basement," said the critics. But cellarless houses, when properly insulated, are warm and certainly save money.

To many people, a house without a basement is like a car without an engine. Yet to spend 15% of your building dollars for a hole in the ground, to house a heating plant which you use only half the year, seems like sinking a lot of money into something that returns far too little service for what it costs.

You can keep a house warm with a first floor heater. Manufacturers have now perfected cabinet heaters and other types that deliver satisfactory service. Made to look like radio and phonograph cabinets and finished in mahogany, walnut and other enamels, the newer heaters are more nearly furniture than heating plants. They occupy small space and are equipped with water pans for humidity, also air circulating devices.

First floor heaters may be had with hot water radiation if you prefer. All types of fuel may be used. An interesting side light on heat for homes is the fact that 50 per cent of all houses are still heated by parlor stoves or the newer types of cabinet heaters rapidly replacing the old parlor stove. Up-

(Continued on page 188)

The Utmost in Sophistication

Know the Real GARBO!

Read this fascinating story of the real Garbo—a new and hitherto unpublished study of this beautiful and ever interesting star!

October

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15c the copy!

If your news dealer is sold out, send 15c to HOLLYWOOD *Magazine, Fawcett Publications, Inc., Minneapolis, Minn., and a copy will be sent direct to you.*

Brain Wave Airplanes

(Continued from page 49)

Another suggestion that has been made is a standard plane with a fabric bag carried in a pocket along the top of the fuselage, to be inflated from gas cylinders in the cabin in emergency, just as an airplane parachute would be released under the same circumstances. The theory is that a parachute large enough to lower the plane stops forward movement, and therefore makes it impossible to pick a landing spot, while a stream-lined gas bag, inflated above the ship, would still enable the pilot to glide and pick his own field.

The trouble is that the weight of gas cylinders would be excessive. The standard large size hydrogen cylinder weighs 135 pounds, and contains 191 cubic feet of gas, compressed at 2,000 pounds pressure. It would take 181 such tanks, weighing more than twelve and a half tons, to furnish enough gas to give a 2,500 pound lift.

Dozens of inventors are working on the problem of combining the lifting effect of gas with the lifting power of a moving wing. The figures quoted in this article would indicate that if a successful solution is found it will be a combination in which not more than half of the entire load will be supported by gas, for beyond that figure the size of the gas bag and its head resistance become prohibitive to speed and maneuverability, the two points which have made the airplane successful.

The successful ship, if it is produced, may not be anything like the one suggested. It may have the wings mounted from the sides of the gas bag instead of below it, and the power plant and propeller may be in the nose of the bag, or divided into a twin engine installation carried in nacelles slung beneath the wings. The latter idea has its advantages in maneuvering, for one engine can be retarded and the other sped up to make quicker turns. Also one engine would keep the ship afloat, with half the load supported by gas.

Anyway, it is an interesting problem, and the activity of various inventors indicate it may soon be tackled in earnest, and perhaps solved. For it is a fairly safe bet that the airplane as at present developed is far from being the last word in heavier-than-air navigation.

Twist the Throttle and the Roads Are Yours

Ride away—over the Thrill Trail—on your Harley-Davidson! Where away? Out to the lake—fish strike hard in the Fall. Over to the marshes for some shooting. Or just out over the roads for a lungful of keen Autumn air, and the thousand thrills of motorcycling, Greatest Sport on Wheels.

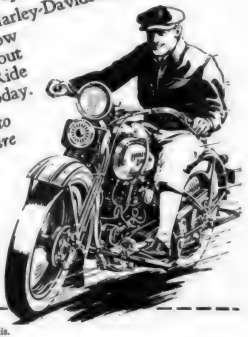
All roads are yours when you open up the amazing power and speed of a Harley-Davidson. You don't need concrete highways—let the auto parades have them, while you whirl away over the roads and trails that wind through Sportland.

Have you seen the 1931 Harley-Davidsons? A dealer near you wants to show them to you, tell you about his easy Pay-As-You-Ride Plan. Drop in on him today.

Send the Coupon to us for free literature

THE 1931 MODELS ARE OUT

—new Twins, Single, and Sidecars. Many big improvements—better looks and performance than ever. See your dealer.



Ride a HARLEY-DAVIDSON

Mail this Coupon

HARLEY-DAVIDSON MOTOR COMPANY, Dept. MM, Milwaukee, Wis.

Interested in your motorcycles. Send literature. Name.....

Address.....

My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check your age group.

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Here you learn EVERY branch of Electricity . . . to be properly and thoroughly equipped for practically any good paying position in the gigantic Electrical industry where millions of dollars are spent each year for new development.

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NATIONAL PREPARES YOU FOR A POSITION

When you finish this complete course you are ready to accept a good paying position. You are fully equipped with a complete knowledge of electrical work . . . prepared to make good and start up the electrical ladder of success.

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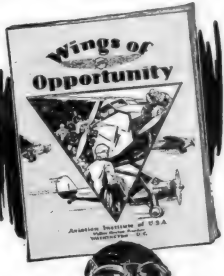

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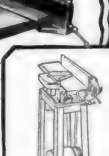
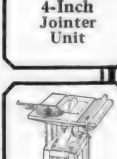
for HOME CRAFTSMEN, FACTORIES, SHOPS, CONTRACTORS AND FARMERS

The introduction of the Delta Jointer and Circular Saw Units marks a new era in moderate-priced woodworking equipment. Now, for the first time, are available sturdy, practical machines in compact, convenient form at price levels astonishingly low. The individual units are built ruggedly to give years of heavy service. Both incorporate many special features of great value. The combination unit affords a compact, convenient arrangement which permits sawing and planing in one quick operation. Either Jointer or Saw can be operated separately or both together. Welded steel stand of convenient height. All three units are furnished with or without motor as desired.

Combination 4-Inch Jointer & 8-Inch Circular Saw



4-Inch Jointer Unit



8-Inch Circular Saw Unit

Watch for Announcement of New 1931 Delta Units

In the next issue of Modern Mechanics there will be announced the new 1931 Delta line of woodworking machines. This announcement will be of vital interest to all those who work in wood. Watch for it!

10 Day Trial — Easy Terms

For complete details and full description of the new 1930 Delta line, send coupon for FREE illustrated literature. Shows many items of interest to those who work with wood. You will learn, also, how you can try any Delta equipment for 10 days under actual working conditions **at our risk.** Choice of three convenient payment plans. Mail coupon TODAY!

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1661-67 Holton St. Milwaukee, Wis.
Dept. M-1030

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Please send me FREE, illustrated literature describing 1930 model "Delta" Woodworking Units. Also details of 10-Day Trial Offer and Easy Payment Plans. (Check special information desired.)

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- ☐ "Delta" Band Saw
- ☐ Moulding Cutter
- ☐ 8" Circular Saw Unit

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Address.....

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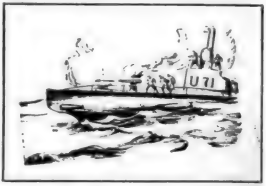
by MALCOLM DOUGLAS

The true story of Floyd Gibbons, Chicago Tribune war correspondent and popular radio announcer. Gibbons got his story in the front line trenches and was decorated by two governments for bravery.

The DEEP SEA DECOY

by HAROLD BRADLEY SAY

A dreaded U-boat invades enemy waters towed fathoms below the surface by a decoy trawler.



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by FREDERICK C. PAINTON

A daring Yankee spy invades Kraut-land and attempts a break for liberty through the danger infested frontier.

On Sale Sept. 10th

In the OCTOBER issue of

Fawcett's **Battle Stories**

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FREE—FREE
DeVry Movie Machine

In accordance with our aim to be first in giving the best we are now offering a Genuine QRS DeVRY Projector. This model is not a flimsy toy construction, instead it is built with Mechanical Sturdiness that will appeal to Dad (who can also use this machine when company comes).

This QRS DeVry Projector is so different, so far ontclasses the Toy Machines that are now offered that we would not attempt to compare the two. It really compares favorably to the real high price machines and has most of the parts exactly that the high priced machines have.

On all high price machines selling from $50.00 to $100.00 the precision film Claw movement is used. This is what feeds the film and is necessary for steady perfect projection. This precision film claw movement is very expensive yet the QRS DeVRY machine we are offering has this feature. In addition the important working parts, gears, etc., are MACHINED (so they won't wear out) while those of toy machines are stamped out and won't last long. Another important feature is the Spring Film Gate that is used on this machine to hold the film firmly in position, so that no matter what speed you decide to turn the crank the film will not slip out of position and will project perfectly same as at low speed.

With the QRS DeVRY machine the motion on the screen is as natural as with high price machines, yet the principles are so simplified that a child can operate it. The illumination is furnished by a 110 Volt 50 Watt G. E. Milky-pe Mazda Lamp which we furnish with the machine; unlike most low priced projectors this lamp has a set filament directly OPPOSITE the lens thus giving 100% illumination. The projection lens and optical system being made by DeVRY needs no other recommendation. Its the best. This machine provides for rewinding film.

The film used is 16MM (Narrow Gauge) one foot of which is equal to 2½ feet of standard film. This is the same film used in all Home Movie Projectors. You can rent, buy, borrow favorite releases and we also direct you where you can secure free use of films.

The QRS DeVry Co. one of the largest makers of MOVIE MACHINES guarantees satisfaction. Never before has this machine been offered on this plan. ROBERT MORE IS ALWAYS FIRST WITH THE LATEST.

GIVEN for selling only 20 bottles Liquid Perfume at 15c each (a perfume novelty free with each bottle) and remitting as fully explained in Premium catalog.

GIVEN—6-TUBE RADIO SET

Nationally known set licensed under RCA patents. Gorgeous Cabinet, size 17x22x13 inches. Regular retail price $60.00. GIVEN for selling 20 bottles liquid perfume at 15c a bottle (perfume novelties free with each bottle) and remitting as explained in Premium Catalog sent with Perfume. Write today, now—Send no money—we trust you.

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Stop craving tobacco in any form. **Tobacco Redeemer** in most cases relieves all craving for it in a few days' time. Don't try to quit the tobacco habit unaided. It's often a losing fight against heavy odds, and may mean a distressing shock to the nervous system. Let Tobacco Redeemer help the habit to quit you. It is pleasant to use, acts quickly, and is thoroughly reliable.

Not a Substitute

Tobacco Redeemer contains no habit-forming drugs of any kind. It is in no sense a substitute for tobacco. After finishing the treatment, there should be no desire to use tobacco again or to continue the use of the remedy. In case the treatment is not perfectly satisfactory, we will gladly refund any money paid. It makes not a particle of difference how long tobacco has been used, how much it is used, or in what form—whether it is cigars, cigarettes, pipe, plug, fine cut or snuff—in most cases, Tobacco Redeemer removes all craving for tobacco in any form in a very few days. And remember, it is offered with a positive money-back guarantee. Write today for our free booklet showing the injurious effect of tobacco upon the human system and convincing evidence that Tobacco Redeemer has relieved the craving for tobacco in thousands of cases.

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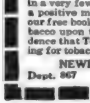

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Write for **FREE BOOK** that describes this money making profession and details of our new-learn home study course and special offer. Write today.

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30x3	$2.29	$1.00
30x3½	2.95	1.10
31x4	3.95	1.15
32x4	3.98	1.15
33x4	3.98	1.15
34x4½	3.20	1.45
35x4½	3.20	1.45
36x4½	3.20	1.45
29x5	3.60	1.75
30x5	3.60	1.75
31x5	4.45	1.75

BALLOON Tires

Size	Tires	Tubes
29x4.40	$2.39	$1.10
30x4.50	2.49	1.20
30x4.50	2.45	1.20
30x4.95	2.95	1.30
29x5.25	2.99	1.35
30x5.25	2.99	1.35
31x5.25	3.10	1.40
32x5.25	3.10	1.40
33x5.00	3.20	1.45
33x5.00	3.22	1.45
32x6.00	3.65	1.65

All Other Sizes

DEALERS WANTED

Send only $1.00 deposit with each tire ordered. We ship balance C. O. D. Deduct 5 percent if cash in full accompanies order. Tires failing to give 12 months service will be replaced at half price.

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3855 Cottage Grove Ave. Chicago, Illinois

Getting Your Radio Amateur's License

(Continued from page 167)

what is coming in. If you keep this practice up persistently you will find as you go along that you are gradually improving. It may prove a nerve-wracking business at times, but after a while you will find things coming easier and easier.

After you have learned to receive proficiently, your next task is to learn to handle the transmitting key. There is a right and a wrong way to operate this key. First of all, allow plenty of room for the arm and wrist, as shown in the photo on page 167. With this position you will find sending easier and less fatiguing.

Another point is: don't hurry. Always remember to send slower than you can receive. Then the fellow to whom you may be talking won't come back at a speed beyond your ability to copy.

Send even and consistently. Don't send one word slowly and the next word fast, but try to inject a sort of musical rhythm that will make it easier for the fellow at the other end to want to continue talking. It is these nice contacts over the air that form eventual friendships that are both interesting and priceless.

With the code learned, and keying and copying mastered, so you have confidence, you are ready for the government tests that will make you a real licensed amateur operator. We assume your transmitter is built and ready to go on the air. This also needs licensing, and the application can be made at the same time that you apply for your operator's license.

There are three classes of amateur operator's licenses: Amateur First Class, Amateur, and Temporary Amateur. MODERN MECHANICS readers need only be concerned with the last two classes. For the Amateur class you must appear before the radio inspector in one of the cities at which they are located, as mentioned later in this article.

First you must be able to send and receive at a rate of ten words per minute, figuring five letters to the word. Also you must pass a test concerning the theory and operation of the transmitter you are using and the Government Rules and Regulations governing transmission. The passing mark is 70%.

Amateurs living at distant points from

(Continued on page 185)

Be The Man Behind The Camera

Earn $2,000 to $12,000 a Year

ADVENTURE—thrills—more action in a week than the average man sees in a lifetime. When you're a motion picture cameraman the world is YOURS! You can travel, if you wish, or there are thrills galore close to home. As a news-cameraman you can be on the spot when things happen—there's no limit to the things you can see and do. Then, of course, there are the big picture studios where you come in daily contact with all the movie stars and actually take the pictures that millions of people see.

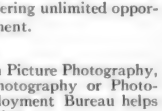
Adventure—sure—plenty of it—AND BIG PAY, TOO! Expert cameramen earn from $60 to $250 a week. Thousands of opportunities await the trained cameraman—opportunities offering fascinating work, big pay and unlimited chances for advancement. Best of all, you need no previous experience to qualify for one of these well-paid positions—to train for the position of your choice.

Billion Dollar Photographic Field Needs You!

Motion picture photography is just one of the many big-paying branches of the billion dollar photographic industry. All over the country today there's a crying need for expert projectionists — for photo-finishers and trained "Still" photographers. No matter which branch of the work you select there are sure to be scores of positions awaiting you—positions paying $2,000 to $12,000 a year and offering unlimited opportunities for advancement.

We Train You In Spare Time

Pick the branch of photographic work you like best—we'll train you for it, in your spare time. Previous experience unnecessary. Age or lack of education no obstacle. If you can read and write English we'll teach you, through our Simplified Study Method, every phase of Motion Picture Photography, Projection, "Still" Photography or Photo-Finishing. Our Employment Bureau helps you secure the position of your choice FREE of extra charge.



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Let us tell you how you can quickly qualify as Motion Picture Cameraman, Projectionist, "Still" Photographer or Photo-Finisher. Our big FREE book gives details about this billion-dollar industry, and explains how you can easily step into a well-paid position. Fill in the coupon—check off the branch of photography you're most interested in, and mail it NOW! It means happiness—success for you!

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- ☐ Motion Picture Projectionist
- ☐ "Still" Photographer
- ☐ Photo-Finisher

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On Sale September 1st

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The guns of a ruthless killer dealt death to eleven persons before the amazing secret of the Twin Cities' slaughter program was solved. This is the first complete story ever told of Jim Barrett's death chain.

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Into the inner circles of the bombing brotherhood went Joe Altmeier in his battle against the dynamiters. Read this thrilling story, written just before he died in a blazing battle wih gang gunmen.

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Who was the beautiful murder victim whose body lay huddled beneath a giant redwood? Her death presented a baffling mystery until a clever deputy identified the girl and helped bring her slayer to justice.

NEW JERSEY'S TORCH SLAYER

A career of crime ranging from forgery to murder was disclosed when detectives solved the problem of the flaming funeral pyre beside the highway.

These and many other TRUE stories will be found in the OCTOBER

On Sale Sept 1st.

STARTLING DETECTIVE Adventures

If your news dealer is sold out, send 25 cents (stamps or coin) to Startling Detective Adventures Magazine, Fawcett Publications, Inc., Minneapolis, Minn., and a copy of the October issue will be mailed to your address.

Getting Radio Amateur's License

(Continued from page 182)

the radio inspectors of their districts can obtain what is called a Temporary Amateur License, which is valid for a year, or until such time as you can appear in person to take the Amateur class license test. The code requirements are the same as the Amateur license, except that your ability must be sworn to before a notary public. The theory and operating test is written and mailed in.

To familiarize yourself better with amateur practices, by all means buy a copy of the "Radio Amateur's Handbook" and subscribe to the "Q.S.T." Both of these publications contain all that is necessary to amateurs, and are published at Hartford, Connecticut, by "The American Radio Relay League." No amateur can afford to be without them.

If you are contemplating taking a license of any class, write immediately to the supervisor of your district asking for all information, including the Government regulations, and application papers. Fill out the latter as specified, pass the code test before a notary public, and return all papers to the radio supervisor.

In the list below you will find the location of the radio supervisor of your district, to whom you should write: First district, Customs house, Boston, Mass.; Second, Customs house, Federal Bldg., Wall, Pine and Nassau Sts., New York City; Third, Customs house, Baltimore, Md.; Fourth, Room 454, Post Office Bldg., Atlanta, Ga.; Fifth, Customs house, New Orleans, La.; Sixth, Customs house, San Francisco, Cal.; Seventh, Room 2301, L. C. Smith Bldg., Seattle, Wash.; Eighth, Room 405 Federal Bldg., Detroit, Mich.; Ninth, Federal Bldg., Chicago, Ill. Address "Supervisor of Radio" at any of these addresses.

When you have passed the tests you will then be ready to go on the air. It will be only a matter then of putting what you have learned into practice. When you finally begin to communicate with other amateurs, you will truly feel you are sitting on top of the world, with the nations at your finger tips. That will be the thrill of a lifetime.

Editor's Note: In an early issue of Modern Mechanics Mr. Robbins will have an article telling you how to build an inexpensive long-range transmitter with which you can talk over great distances to fellow amateurs.

"The Boss Was Stumped"

"He was trying to figure out a way to speed up the machines. I could see he was stumped and I asked him if he would let me try my hand at it.

"'Go ahead,' he said, 'but I don't believe you can help much. Looks like an outside job to me.'

"So I started right in and pretty soon I had the whole thing worked out. The boss was watching me and I could see he was surprised.

"'How did you learn all that?' he asked in that quiet way of his. And then I told him I'd been studying at home nights through the International Correspondence Schools.

"He didn't say anything more and I thought he had forgotten all about it until he called me in his office a few weeks later and said he was going to make me foreman and increase my salary $75 a month.

"'Keep on studying,' he told me, 'and you'll get another promotion soon. You can't beat those International Correspondence Schools text-books for good, sound, practical knowledge.'"

That's a true story of what spare-time study has done for just one man. There are thousands of others. Why don't *you* take up a home-study course with the International Correspondence Schools and prepare yourself to earn more money? At least get the facts.

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 2328-G, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

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☐ Electric Lighting	☐ R. R. Locomotives
☐ Welding, Electric and Gas	☐ R. R. Section Foreman
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☐ Telegraph Engineer	☐ Air Brake ☐ Train Operation
☐ Telephone Work	☐ Highway Engineering
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☐ Mechanical Draftsman	☐ Coal Mining Engineer
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If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

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All store and shop, you make over $1.00 on every sale.

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1. Who is your favorite World-war ace and why? (See page 84.)

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UNITED PORTRAIT COMPANY

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Science on the Trail of Crime

(Continued from page 64)

lectures to police lieutenants, detectives, and assistant state's attorneys. We are subject to call at any time to investigate any case in Chicago or Cook county, without charge to the government, and also send men frequently to other cities, for which a fee is charged.

The latest addition to our staff is Inspector Ferdinand Watzek, a famous "moulage" expert of twenty years' service on the detective force of Vienna, Austria. Moulage is the art of preserving exact casts of any object. If a burglar pauses to take a bite from an apple on the sideboard while collecting the family silver, we can reproduce the apple in an exact wax cast, permanently preserving his teeth marks for comparison with teeth casts of suspects. A burglar's jimmy mark on a door or window can be preserved for comparison, under a microscope, with a jimmy; foot prints cast for future comparison with shoes, or any part of the body, or the entire body, permanently copied. In Europe these life-like casts of murdered persons are often made for future identification, or use in courts. They are so perfectly made and colored it is impossible without close examination to detect them from a real body.

Besides making casts, Watzek also is an expert on finger-printing, identification of handwriting, and the microscopic study of hair, dust, textiles, etc. Dust particles found in the cuff of a suspect's trousers, on his clothes, or in the wax of his ear has often been sufficient to solve baffling mysteries abroad, and now we are prepared to do the same thing here.

We also have our own expert on poisons and chemical analysis, Dr. C. W. Muehlberger, assistant director of the laboratory and former state toxicologist of Wisconsin, where for seven years he made scores of analyses in autopsy cases and obtained numerous convictions.

He is just now introducing in America a chemical test for intoxication which has been used for some time in England. Eye witness testimony about the degree of a person's state of intoxication or testimony as to the amount of liquor consumed, is seldom satisfactory—the first because witnesses differ, and the second because ability to "carry

(Continued on page 188)

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THIS is indeed the age of opportunity for the young man or woman who likes to draw. Every age and race understands pictures. Literally millions of dollars are spent annually for magazine and newspaper illustrations, cover designs, pictures in ads, posters, etc. Modern business offers rich rewards to the trained artist who can produce *good* work.

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Science on the Trail of Crime

(Continued from page 186)

one's liquor" varies so widely. In the chemical test a portion of the chemical is mixed with a sample of kidney secretion, and the mixture turns color in proportion to the amount of alcohol in the blood, and therefore circulating to the brain. A man who becomes drunk on one drink, and one who gets equally drunk on a quart, will both show the same amount of alcohol in the blood stream, so this is an exact index of the degree of drunkenness.

In our lie detector we have one instrument which no European police department as yet has, but it will take at least a generation to get scientific crime detection established in America on a footing comparable to that practiced in London, Paris, Lyons, Madrid, Vienna, Rome and other foreign cities, and to get the courts and law makers to recognize the validity of scientific evidence.

How to Clip $2000 Off Your Building Bill

(Continued from page 171)

stairs heat is therefore not a new idea.

Take closet beds for example. At first they were said to be all right for cliff dwellers in big cities who live like sardines in a can. But apartment builders have learned a lot about saving space and making one dollar do the work of two. Closet beds are high up on the list of money savers. There's no reason why they should not be used in small houses to replace an extra bed room and save from $500 to $1000.

There you have four ways to clip $1500 off your building bill. Some rough work by yourself and you may save an extra $500 for labor.

Let's see how these features have been used in the triple purpose bungalow to keep costs down. The house started out as a lake cottage. The owner liked it so well he decided to live in it the year 'round. And in a climate where the mercury often hits zero. To make the bungalow weatherproof he used large surface insulation boards and applied them direct to the studs as inside finish. He weatherstripped doors and windows. He dug a small excavation and installed a small warm air heater, although

he might just as easily have used one of the upstairs cabinet heaters I have described. That's about all except to say he was a handy man and did quite a bit of the work himself.

Study the plan. The closet bed next to the fireplace provides emergency sleeping service. It can be pulled out into the living room or onto the dining porch. With one bedroom and the closet bed you can accommodate four people overnight. With two bed rooms and the closet bed you can take care of six people. Two more can sleep on the broad front porch, at least during the summer months. This porch may be enclosed and will then offer all year service. There's the further possibility of renting the front bedroom. A door opens directly onto the porch. This would permit a roomer to enter the house without disturbing the family.

Finally this bungalow has been developed in log cabin effects for those who want an attractive, flexible layout for lake or mountainside.

The house as it stands is frame construction, wide siding and shingle roof, either wood or composition. Frankly, it offers as much in service, style and flexibility as any house you'll find in long search. What's more, you should be able to build it without warping your pocketbook out of shape. Remember this. There hasn't been a time in the last five years when conditions were more favorable for building than now. Money is cheap, the market is scraping bottom, and frankly I'd say the wise home builder, the man who wants to make his dollars buy the utmost in values, will build this fall. Prices are bound to be higher in the spring.

Watch for the New Flying Manual!

Start money-making business of your own. Mechanics, filling stations, repair shops, garages, battery stations are all making big money with HB 3-Hour Battery Service. Recommended by leading car and battery makers. Lets you give a better charge than the other fellow in ⅓ the time, with a saving of 30 to 50% on current. Anyone can operate. Coupon below brings details on how to get started in this money-making work.

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Dependable Air Service brings customers right to your door. HB automatic, upright Air Service is standard equipment of money-making shops. A size for every need. Trial and easy terms. Coupon brings details.

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HB Paint Spray lets you do work of 5 brush painters. Paint automobiles, houses, barns, garages, furniture, etc., quicker and better. A size for every need. Easy terms lets it pay its own way. Coupon brings details.

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Hobart Welder starts you on road to success with practically no expense in the biggest money-making business of the day. Anyone can easily get into this profitable business. Coupon brings details.

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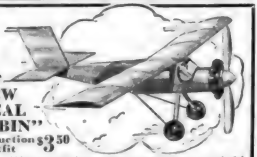

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(Continued from page 90)

are rare. Radio broadcasting companies are in the market for them all the time. He must be able to carry out such a speech as the following without a hitch:

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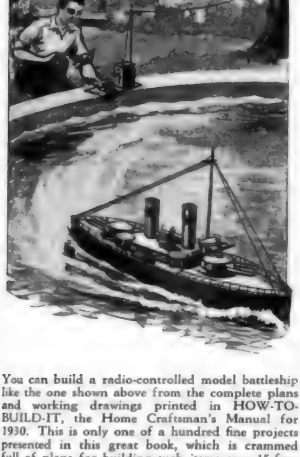

You can build a radio-controlled model battleship like the one shown above from the complete plans and working drawings printed in HOW-TO-BUILD-IT, the Home Craftsman's Manual for 1930. This is only one of a hundred fine projects presented in this great book, which is crammed full of plans for building such items as a 15-foot sailboat; a water glider; a canvas canoe; marionette show; model airplanes; radio sets; home furniture; magic lantern; electric motors; ozone generator; sleds, iceboats, and scores of other features.

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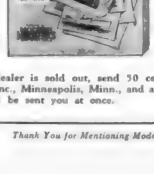

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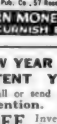

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Building the Anzani Longster

(Continued from page 152)

and then brazed all around. This distributes the strains back up on the tube and makes a safe job.

The landing gear is the simplest that can be built. The axle is 12 or 14 ga. tubing. The rear radius member is 1 inch by 20 ga. tubing. A disc exactly like those for the fuselage is brazed on as an end bearing for the wheel hub, and to this disc the radius rod is riveted and brazed. The shock strut is 1 by 20 ga. with a 6-inch slot that just fits the axle built up at the lower end as shown. The shock cord is wrapped around the lower crosspiece of this slot and up over the axle, making a simple fool-proof job.

It will be noted that the front wing struts are cut out about 14 inches from the fuselage. The ends are reinforced and the outer length is shaped to telescope over the short piece about 3 inches. Through this joint is put a 5/16 eyebolt, the eye of which makes the bearing for the shock strut. This eyebolt also takes the 1 by 20 ga. brace that runs forward to the reinforced pedal station gusset where it is bolted. The eyebolt also takes the 1 by 20 ga. brace that runs from the strut up to the dash.

The dash is a piece of ¾ by 7½ spruce carefully fitted between the struts and held with an 18-gauge clip at each end. On it are mounted the throttle and instruments, but do not cut too many large holes in it, for it is a stressed member. At the rear of the cockpit is a similar piece only 4 inches wide to which the rear spars bolt.

The floor of the ship is ¼ plywood fastened to the longerons and struts with clips. The seat may be your choice, except that it must be about 8 inches off the floor in the center to allow the elevator push rod to pass back under. The tank is of sheet galvanized iron and holds 4 gallons. A 1-gallon compartment is built in for oil. It is fitted with connections for pipe line and mounted to the dash and longerons between the dash and motor. The top of the station back of the cockpit is covered with 3/16 plywood as a means of getting in and out. A step is cut in the fabric as shown. The front of the tail skid is bolted to a flat plate across the lower longerons, and this plate is braced by 3/16 rods as shown.

Now comes the control system, one of the hardest jobs on the ship. The rudder works by pedals and the rigging is simple, but the

by **Les Long**

stick is complicated and would take too much space to describe fully. You will have to work out your own salvation. If you can get a look at a Jenny you have the whole thing. Briefly, the rudder cables are 3/32 flexible aircraft cable and run almost directly from pedals to horns. The cables run through 2-inch lengths of bakelite or copper tube securely wired to the fuselage at intervals. The aileron cables are ⅛, and run from eyes on the stick down through and under pulleys fastened to the lower longerons, up along the wing struts, into the wing through a short length of copper tubing stapled to the beam, through the inside pulley and to the horn.

The top horn cable goes through the other pulley and along in front of the beam, is connected to a turnbuckle between the longerons and just in front of the dash and thence through to the top horn on the other wing. A cable from the lower horn of this other wing back down to the stick completes the circuit. Use care and see that everything works smoothly and that the cables have no chance to jam or bind.

The pushrod passes from the stick under the seat and to a "rider" hinged to the horizontal fuselage strut. From the other side of this rider the rod goes straight to the elevator horn. A plywood guide is placed halfway back to prevent vibration. The pushrod is ¾ by 22 ga. clear through, and the little rider is simply an inverted "V" of ½ 22 ga. tubing. The stick itself is ¾ by 20 ga. and has a universal joint at the bottom, which you will have to make up out of sheet in the shape of two clevises. The aileron cable turnbuckles connect to a flat piece of steel about 3 inches long, which is put through a slot in the stick and brazed in. Holes in the ends of this piece take the turnbuckle pins. A sort of universal joint must be made for the pushrod and another at the rider. Do your best and be sure it is strong.

Covering the fuselage is simple. Pieces of half-round ¾-inch spruce molding are laid along the center of the sides, top and bottom and fastened with soft wire. The fabric is pulled tight and tacked to these and the seams taped over.

Attach the tail group next. Two 16 ga. angles at the rear of the fin are held to it by one ¼ bolt, and ¼ bolts are run through

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these angles down through the stabilizer and the angles on the fuselage. A single bolt goes through the front of the fin and through the stabilizer and through a reinforced hole in the short horizontal fuselage strut. The front stabilizer braces are ½ by 22 ga. tubing, bolted at the bottom to reinforce gussets at the bottom of stabilizer station, and at the tops to the beams. The rear bracing is the same type struts as in front on the lower side, but the upper bracing is No. 14 hard wire and turnbuckles attached to pulls near the top of the fin. True up and attach the elevator and rudder.

And now you can bolt on the wings, cut the struts to give about 2 degrees of dihedral and rig the control system. True the wings square and keep them there with the diagonal braces between the struts. These cables are ⅛ and the pulls at the ends 16 ga. Be sure to safety all turnbuckles. The tires may be either 18 by 3 or 20 by 4 as the same wheel takes either size.

Balancing is the final job. Place a short length of 2 by 4 timber from beam to beam just outside the wing struts under each wing and lift the ship up onto high horses that have a rounding top. With the wheels clear of the ground and pilot in the seat the ship should balance evenly with the weight supported 30% back from the leading edge of the wing. If nose heavy use a heavier skid or place a small bag of shot at the tail. If tail heavy move the seat forward a trifle.

And finally, DON'T try to fly this ship unless you are a regular pilot. Get a test pilot to try it out, and take at least enough lessons at a flying school to solo. When you have done that the air is yours.

Nutty Inventions Make You Laugh

(Continued from page 76)

"It's a horse without a name. You've seen something like it before. No circus is complete without one. One fellow makes the front part and another gent makes up for the hind hoofs, and it's their job to coordinate. So far there's nothing new under the sun about that mule.

"Aha! But how about when I stroll up to this here horse and I says to him, patting him very gently on the flank, 'Make it a Scotch high,' and presto! a compartment opens up with a bottle and the rest of the fixings? It's a fool invention, but Mr. Ziegfeld, the greatest theatrical producer in the

world, pays me the highest salary of any comedian on the American stage for just an invention like that.

"A couple of years ago I knocked 'em for a row of Capones out in Chicago when I made public my invention of the laffometer. It was a sensitive and minute instrument which could gauge the extent of your laughter by the vibrations of your body. I could not find anyone in Chicago with a sense of humor, so I didn't make a nickel on that one.

"Getting down to basic statistics, I'm a Quaker boy, meaning I hail from the city of brotherly love which, in case you have forgotten, is Philadelphia, Pa. My father was a manufacturer of hats, and I guess that's where I get my ideas for the queer sombreros that I wear.

"If you ask how I happened to rise as a star, I shall ascribe it to my success as the most foolish, though perhaps one of the highest-paid, inventors in this country. Of course, my inventions deal with the lighter side of life. But it's when they strike home, like any good joke, that they're best.

"For instance, there are little delicacies of the table which, when neglected, are apt to cause embarrassment and blushes. I curbed the squirting grape-fruit by my famous invention of windshield-eye-glasses which are carried in one's pocket and put on when sitting down to grape-fruit.

"For the soup tenors I evolved a noiseless soup-spoon. Then I got a patent on a tin crumb-snatcher. This was attached to the cuff and prevented the crumbs from falling on the rug and making so much trouble for your hostess. You wouldn't find these things in the ritziest of restaurants, but you'd be sure to find them in my show. You see, I figure a good star has got to be a good inventor, fool or no fool.

"I don't know just how you feel about this, but I'm sort of old-fashioned in a way and I like to drink my coffee out of a saucer. So I've invented a cup which has a hole on the bottom which is covered by a shutter. This shutter is released by pressing the top of the cup handle. In this way, the coffee flows directly into the saucer without spilling.

"Oh, yes, 'way back there I promised to tell you why you can't use a two-hour candle in that invention for regulating naps. It's simply this: It's not a nap if it's two hours long. Anyway, I love inventions."

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Mapping Alaska's Fortunes

(Continued from page 71)

which operate simultaneously, giving four exposures on two films. The main film, on which three simultaneous exposures are made, measures 380 feet long, while a second film, about 100 feet long, receives a fourth exposure.

Forty film units were taken. The center of the three exposures on the longer film gives a true vertical picture. The two others on each side are made at angles of 35 degrees. On the second film the exposure is taken in front of the line of flight. In order to use the two side pictures and the front angular picture, it will be necessary first to transform them so as to give a projection into the vertical plane. For this purpose special transformers are utilized.

On one flight over Muir Glacier the plane rose to an altitude of 13,000 feet. From that altitude its occupants could see a vista of peaks and snow and icebergs on which not a living thing exists or ever has existed. The mountains in that locality are different from any others I ever have seen. These are stark and bare, and their rocky walls rise perpendicularly from canyons some of which are covered with snow thought to be a mile deep.

From one point one could see many glaciers, rivers of ice. These are remnants of that period a quarter million years ago when the United States was ice covered as far south as Missouri. These glaciers are fed from a common ice field whose extent can only be estimated. They are caused by the weight of snow in the ice field forcing the snow and ice out of narrow passes in the mountains and on down narrow valleys. From high altitudes these glaciers appear smooth. A closeup view reveals many ridges and crevasses over which foot passage would be practically impossible.

Fortunately we suffered no forced landings over these glaciers. What would have happened, even had it been possible to bring the plane down successfully, can remain conjecture only. Many heaps of rock and snow and ice projected to threaten a plane in landing, and it would have been a miracle indeed had any party escaped should disaster have overtaken them.

This flight, like most of our Alaska flying, was undertaken in mid-day. The flight for photography is never the best in the north and camps can be made only around noon on bright days.

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Machines That Take the Census

(Continued from page 158)

that, notwithstanding the fact that more information has been obtained about each person, and the population of the country has increased 17,000,000 persons during the last decade, the results will be published to the world more quickly and more accurately than in 1920.

The Bureau maintains its own mechanical laboratory, where new machines for tabulating census information continually are being designed and constructed. A new automatic gang-punching machine that has just been developed, for instance, will perform the work done by 10 machines of the type used in 1920, and will do it more accurately. Another machine used this year sorts 140,000 census cards a day—a task that would require the labor of 50 diligent clerks.

When the 100,000 census enumerators collected census information at the front door steps these past few months, the answers to the questions were put down by hand on large blank forms called "schedules," on which the questions to be asked had been printed. Now, when these schedules reach Washington they are examined painstakingly and an immediate hand count is made of the population of each state, county, city, township and ward in the nation. Whereupon announcements concerning the population of these civil divisions are made at once, based on the count thus obtained.

After the population figures have been determined, the 1930 schedules are sent to a punching room at the Census Bureau, where the facts about each individual in the country are registered on a separate card. This is done by punching holes in a form card with a new and especially devised punching machine, by means of which a single clerk can punch 2,500 cards a day, whereas in 1920 the average per clerk was around only 800 a day.

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(Continued on page 200)

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Machines That Take the Census

(Continued from page 198)

The second sorting is according to color. Each sex is now separated into whites, blacks, Indians, Mexicans and Hawaiians. All other races, such as Turks, Persians, Afghans, or Malaysians, are classed as "other colors."

The third time the cards are run through the sorting machine they are separated according to nativity. Each group of cards, those for Japanese males, white females, Mexican males, and so on, are sorted according to whether the person was born in the United States or abroad, whether both parents are native-born, or whether one is native and one foreign-born.

All the cards for the entire nation are run through the sorting machines three times to separate them according to sex, race and nativity. Afterwards, special sortings according to age, occupation, citizenship, or other items of information are made for certain classes of the population, or if desired, for the country as a whole.

The third and most important mechanical process is to tabulate the information contained on the cards. A combination adding and tabulating machine, by far the most delicate and complicated mechanism used in all census work, has been perfected to the point where it can count and register 59 combinations of facts each time the cards are handled.

A stack of cards, as they come from the puncher, could be run through the tabulator before being sorted, whereupon the machine would register the number of persons of each race, how many there were of any given age in each race, how many of these were born in the United States, how many could read and write, and how many were veterans of the United States military or naval forces, and a dozen other facts.

The second mechanical process, after the cards are punched, is to sort them, according to age, sex, or whatever is desired. A sorting machine, an apparatus with uncanny fingers which run across the cards to find where the holes have been punched, separates the cards into the desired groups according to a particular class of information. For instance, if the Bureau wanted to find out how many native-born Chinese women there were in the United States, the machine could be set so that it would separate the cards for such persons.

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WHEN firemen invade smoke-filled cellars and rooms filled with dangerous gases they now keep in touch with their chief on the outside by means of a portable telephone and insulated wires.

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ICEBERGS in the North Atlantic, one of which ripped the bottom out of the *Titanic* fifteen years ago and caused the greatest maritime disaster in history, probably will be more plentiful this winter than they have been for years. The reasons for this, says Herbert Janvrin Browne, consulting meteorologist, of Washington, D. C., are the recent history of sunspots and the present position of the moon. The English meteorologist, Dr. C. E. P. Brooks, recently compiled, Mr. Browne states, an "ice index" corresponding to the escape of icebergs and ice floes from the fringes of the Arctic ocean for every year between 1895 and 1924. Mr. Browne compares this ice curve with a curve showing the annual variations in the number of sunspots.

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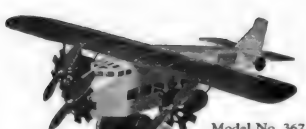

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Preparing For the Hunting Trip

(Continued from page 83)

convenient in moving from camp to camp.

A tent will be needed to provide protection. The best all around tent is a light weight "lean-to" about 7x9 feet, with ample head space and fitted with a curtain of cheesecloth.

A folding stove may be taken along, although many experienced hunters prefer to build their own camp fire in the open, making the necessary hooks and arms from which to hang posts.

In the first weeks of the moose season it is possible, by tenting out, to travel over a large territory from one central point. It is a thrilling experience, especially when the hunter is able to travel by canoe, moving camp from site to site. In a good water country during the dry season more game may be seen than on a still hunt, with less travel than possible when the hunter tracks down his game. Such a trip may, by packing back, be extended into the most hardy of adventures.

On the other hand, if there is just enough snow and wind to make tracking easy, and the guide is a past-master in the art of still hunting, most woodsmen agree that more big heads will be seen on the ridges than at any other period.

Both types of hunting differ as to method and environment and each has to be experienced before any true realization can be arrived at as to just what moose hunting really is.

Those who go back into the hills for moose or caribou may easily get a few bears. This is hardy sport, and the game is located by means of binoculars and stalked with little or no shelter. Hunting bears during the day, many hunters spend their evenings moose hunting. A good low trajectory rifle is best in bear hunting.

A famous hunting empire is that vast wilderness above Lake Superior. "Any way you choose to go, the trail leads to moose," declared the trading post factor at Long Lac, Ontario.

"I always plan a long trip," confided the guide. "There is little fun in getting your moose the first day out. Here we have moose, caribou, deer, and plenty of black bears, so the trip is diversified." Waterways lead from the Great Lakes to Hudson Bay, providing an excellent canoe route for packing supplies in and bringing the "kill" home.

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Drill Point and Depth Gauge

WHENEVER there is drilling to be done this combination drill point and depth gauge will prove to be an almost indispensable tool. The depths of holes as small as 3/32" in diameter may be gauged using the rod furnished with the tool for the smaller holes. The device may also be used for checking the angles of drill points when grinding them and determining if the point is centered.

Gardener May Test Soil at Home

A SMALL porcelain plate carrying a surface hollow shaped like half of a slender dumb-bell is now used to tell amateur gardeners whether the soil they expect to use is too acid, too alkaline, or just right for the intended seeds.

Into one of the depressions on the plate the gardener puts a small spoonful of his soil and pours on a small quantity of indicating solution. When soil and solution are well mixed a few drops of liquid are run into the other depression by tilting the plate. The color of this solution indicates, by comparison with a chart, the degree of acidity or alkalinity.

Operating Surgeon Hears Heart

APPARATUS by which a surgeon can hear the heart of his patient beating while he is operating, so that emergency measures can be taken promptly in case of threatened heart failure, has been devised by Dr. Ernst P. Boas of Mount Sinai Hospital, New York City. At present the heart action of a patient on the operating table is watched only by the anesthetist, who occasionally feels the pulse with his finger. The operating surgeon has no way of knowing the condition of his patient's heart unless the anesthetist tells him.

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The "Why" of Supercharging

(Continued from page 163)

in coming through the carburetor is turned into a perfectly combustible vapor before it is forced through the intake valve into the cylinder. (An interesting experiment was tried in supplying fuel to a supercharged engine by means of introducing raw gasoline into the blower intake with a common squirt can. Even with the gasoline introduced in this way the engine ran evenly, demonstrating the ability of the blower to make even this raw mixture into a proper vapor before reaching the cylinders.)

It should be noted that the rotors do not touch each other but at all times during the circle of their rotation have a slight clearance amounting to approximately three one-thousandths of an inch. Consequently there is no friction, with no resulting loss of power and no wear. The rotors are direct driven by hardened steel gears which are inclosed in a housing and run in a bath of oil. They are accurately machined and balanced to prevent vibration and are mounted on ball bearings thus keeping friction and power loss to the minimum.

For example, the blower used on the Niagara model HFS high speed four-cylinder engine of 3½-inch bore and 4-inch stroke uses approximately 2¾ horsepower at its top speed. This engine is shown in the cut on page 162. In return for this small power consumption it adds over 50 per cent to the power generated by the engine, enabling it to deliver 60 full horsepower instead of the 40 horsepower which an engine of this size and type would normally deliver.

This device is very different in design and construction from the superchargers that have been known in connection with high speed automobile racing, these racing superchargers being of the centrifugal type and operating at far greater speeds than the Roots blower described above. For example, two of the best known racing automobile engines operate their centrifugal superchargers at speeds of from 24,000 to 32,000 revolutions per minute which is approximately five times the crankshaft speed of even a racing engine. It can be readily seen that turning at this terrific speed the small air impeller must be made with the accuracy and delicacy of a fine scientific instrument. This precision, which is necessary in the making of these centrifugal blowers for

by W. S. Reed

such terrific speeds, makes their cost enormous, running to as high as $800 to $1000 with the special driving mechanism which they require.

The Roots type of blower on the other hand is run at crankshaft speed or slightly above it, which in the case of the average marine engine means from 1500 to 3000 revolutions a minute or only about one-tenth as fast as the centrifugal type of superchargers used on racing automobiles and referred to above. *Consequently it is subject to no more wear and tear than there is on the average generator, water pump, or other attachments*—in fact not as much because of the clearance between the wings—and the blower is no more likely to get out of order than any of these other devices.

Also the Roots blower is not open to the complaint that is frequently made on other types of superchargers on the ground of noise.

However, it must be remembered that when a blower is added to an engine the strength of the working parts of the engine must be increased enough to take care of the additional load which the blower puts upon them and no one should be indiscreet enough to attach a blower to the average engine not designed for it as it would be only a question of a short time before the *engine parts*—not the blower—would give way under the extra strain.

Another way in which the supercharger improves the performance of the engine is that owing to the fact that it gives normally a pressure of from four to six pounds the actual *shape* and *size* of the manifold as well as the distance to the last cylinder from the blower *makes no difference.* Also should there be a weak cylinder this has no appreciable effect upon the amount of mixture that is received due to the fact that the entrance of the charge does not rely upon the suction of the individual cylinder, but the gas is waiting there to get into the cylinder immediately the valves are opened.

With the usual carburetor arrangement a weak cylinder, that is, one with weak compression due to wear of cylinder wall or rings, does not receive sufficient mixture because of the weakness of its suction power. This is where the blower has an advantage, because it actually pushes the gas into the cylinder without depending at all upon the suction of the piston. Even if the piston

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The "Why" of Supercharging

rings should be entirely removed from one or two cylinders the motor will still run almost as evenly because the blower is keeping every cylinder properly filled.

Of course, no one would ever think of running an engine under such conditions but a great majority of all the engines in use have one or more cylinders in which the suction is weaker than in the others. To correct this and make these weak cylinders fire, the usual method is to adjust the carburetor so as to make the mixture richer. This results in over-supplying the other cylinders, with a consequent loss of fuel and makes the engine overheat.

Another great value in the blower is the fact that the mixture going to every cylinder will be uniform and for this reason, together with complete filling, an economy will be shown for the amount of power derived.

To illustrate this, if a standard 150-horsepower engine used 12 gallons of fuel per hour when under full speed and full load, the same engine with a blower attached, developing 200 horsepower would not use 16 gallons, or a third more, as there have been savings in fuel consumption by the use of the blower as high as 15 per cent. In average performance at least 12 per cent can be counted on. A simpler illustration of this would be a standard 150-horsepower engine using 12 gallons per hour and the other an average 100-horsepower engine supercharged to also develop 150 horsepower. The latter engine would probably use 10 gallons per hour as against the 12 gallons of the standard engine developing the same horsepower and in addition to this would probably have 150 to 200 pounds less actual weight than the other power plant.

Anyone familiar with gasoline engines knows that the power is in direct proportion to the weight of the mixture that is put into the cylinder and for this reason the down-draft carburetor has come into use, as it will allow the use of larger air intake; by not having to raise the fuel, a greater amount can be spent into the cylinder as a combustible mixture than with the usual up draft type. Gains up to 12 or 14 per cent have been noted by many using the down-draft construction, while the general average is at least ten per cent. Naturally with the down-draft carburetor it is very seldom necessary to apply heat to the manifold to

by **W. S. Reed**

help vaporize the incoming gases and carry them to the valves.

However, it can be readily understood that no carburetor application, either down or up draft can go further to assist the power of the engine, because both are dependent entirely upon the suction from each cylinder which draws the gas in.

To sum up, the fundamental reason for the use of a blower is to increase the maximum horsepower of an engine without increasing the bore and stroke and consequently the entire size of the engine as well as its weight.

As a concrete example of what is accomplished by the correct application of a supercharger let us take the eight-cylinder Niagara engine which has a four-inch bore and 4½-inch stroke. With the usual type of intake and carburetor this engine develops 152 horsepower and weighs 882 pounds. With the supercharger added it weighs only 60 pounds more and develops 201 horsepower at the same crankshaft speed. To develop 201 horsepower with an engine having the same strength and ruggedness but without the supercharging device it would be necessary to increase the diameter of the pistons to at least 4½ inches and the stroke to 5 inches.

This would not only increase the length and height of the engine, but would necessarily increase the size and weight of all parts, particularly those that are reciprocating such as the piston, piston rings, piston pin and upper part of the rod. It is a known fact that when these weights are increased to a certain point the speed of the engine is limited, and consequently in order to obtain the greatest speed range and flexibility, engines have been kept down in size of cylinders, but have been increased from four up to eight cylinders as a means of obtaining more power. It is easy, therefore, to understand just why it is an advantage to obtain 200 horsepower from an engine of given weight with a supercharger rather than to build the much larger and heavier engine which would be necessary to obtain the same power without supercharging.

NOTE: Mr. Reed is a recognized authority on high speed marine engines. At the present time he is chief engineer of Niagara Motors Corp. Formerly he was with the Universal Motor Co., and has also had many years experience in the automotive field.—Editor.

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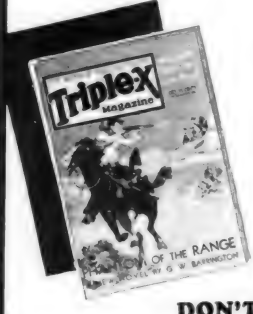

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2. Why do you believe you could learn to be a good aviator? (See page 84.)

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STED PITT, Dept. I-O, 153 Court Street, New Haven, Conn.

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Kant-Slam is different from any other door control. It's not pneumatic, but is built on new oil principle, that controls door like human hand. Gives lifetime service without adjustments. Always efficient in any weather.

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Look! A full sized sample or miniature door furnished every active agent! Can I offer you more than that? An actual working sample mounted on an easy-to-carry, light weight miniature door. With this clever demonstrator you can't fail. Sales pour in, and in just a few minutes' time. Demonstrate this clever device —tell how it saves thousands of dollars each year in fuel and broken glass, and you're bound to make good. Mail the coupon for **Amazing Free Offer.**

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"One installation sold 6 more," says J. C. Adams, Ohio.

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Ship me the Corona, F. O. B. Chicago. On arrival I'll deposit $2 with express agent. If I keep the machine, I'll send you $3 a month until the $37.90 balance of $39.90 price is paid; the title to remain with you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent and get my money back. You are to give your standard guarantee.

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